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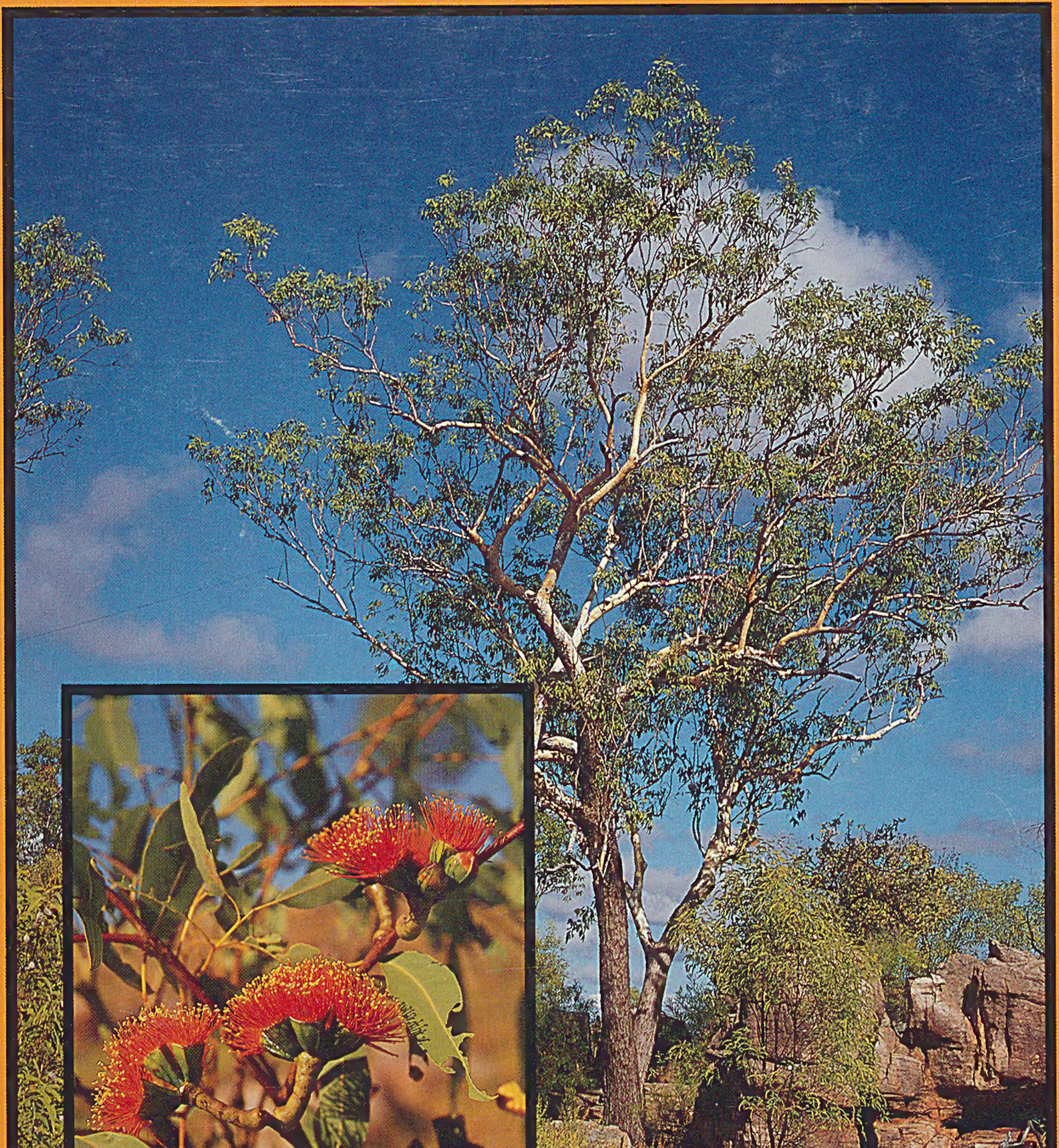

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Cover photograph
Eucalyptus miniata, Prince Regent River Nature Reserve, Western Australia. [A.S. George, Aug. 1974]

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Foreword

The Flora and Fauna Series comprises occasional publications designed to make available, as widely as possible, the results of biogeographical activities and projects undertaken by, or on behalf of, the Bureau of Flora and Fauna.

This third number deals with the geographic patterns found in *Eucalyptus* in Australia. The work describes the results of analyses of distribution data for *Eucalyptus* compiled in a joint project of the Australian Biological Resources Study and the Commonwealth Scientific and Industrial Research Organization.

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NATURAL HISTORY

Phytogeography of *Eucalyptus* in Australia

A.M. Gill[1], L. Belbin[2] and G.M. Chippendale[3]

Abstract

Three major types of patterning have been defined using quantitative methods, *viz.* 'zones' for areas with similar taxa, 'taxon groups' for areas with similar areal distribution, and 'patterns' of taxon richness for the genus and for subgeneric groups. Eleven major 'zones' and eighteen major 'taxon groups' were defined. Twenty-five zones, five subgeneric groups and overall taxon richness are mapped.

Taxon richness was greatest along the coast of New South Wales but also substantial along the southern coast of Western Australia. The most taxon-rich subgeneric groups, *Symphyomyrtus* and *Monocalyptus*, had nodes of taxon richness in these same areas. The less rich subgenera, *Blakella, Corymbia* and *Eudesmia*, had two areas of taxon richness in common, *viz.* north-western and north-eastern Australia while *Eudesmia* also had a node of increased richness just north of Perth in Western Australia.

Ten meteorological variables were used to look for correlations between climate and our patterns. The subgenera divided into a warm-sited conglomerate of *Blakella, Corymbia* and *Eudesmia* and a cool-sited one of *Symphyomyrtus* and *Monocalyptus*. Within these conglomerates, the areas occupied by the subgenera had different averages for precipitation variables. When all taxa were considered, irrespective of subgenus, there appeared to be a negative correlation between the length of the average dry period and the number of taxa per mapsheet. The taxon-rich cool-season groups were related to the length of the dry period but the warm-season groups were not.

One picture that emerged was of an ancestral eucalypt giving rise to three warm season and two cool-wet season progenitors of current taxa. The former progenitors radiated in the north, the latter in the south. The former gave rise to *Blakella, Corymbia* and *Eudesmia*, the latter to *Monocalyptus* and *Symphyomyrtus*. The zones and taxon groups we see today could be the result of such a process. Disjunctions in the distribution of *Monocalyptus* and *Corymbia* suggest that wider distributions of both subgenera occurred in the past: an ebb and flow in the distributions during the history of the genus seems to have been inevitable.

Introduction

The aims of biogeography, and its subdiscipline phytogeography, could be stated as the seeking and understanding of geographical patterns in the distributions of species, assemblages of species (or higher taxa), vegetations and biotas. Our aim here has been to determine areas of land with similar species compositions, to identify groups of species with similar areal distributions, and to discover patterns of species richnesses, particularly at a subgeneric level, for *Eucalyptus* L'Hérit. in Australia.

Eucalyptus is a large genus with a wide distribution. Because of this, a grasp of patterns in composition, distribution and richness is difficult to obtain subjectively except at a very broad level. This is especially so for groups of species with similar distributions. With computer processing, however, rules of classification can be devised to reveal patterns in data at various levels. This study utilises computer processing and therefore emphasises the quantitative approach.

Regional zonations have been the major focus of biogeographic research in Australia. However, Beard (1981) in providing an historical perspective of phytogeography in Australia noted that regional maps have generally suffered from vagueness, small scale and inadequate basic information. In the present instance, vagueness was minimised by using objective methods of classification, scale was fixed by the use of the 1:250 000 mapsheet series (following Brook 1976), and the basic information was the comprehensive data base of Chippendale and Wolf (1981). Complete objectivity was, and is, not always possible but repeatability is. Our aim was to conduct this study in such a way that others using the same methods could obtain identical results.

Groups of species with similar distributions are particularly hard to conceive from a large data base so it is perhaps not surprising that there has been no subjective grouping of this type. At subcontinental and regional scales, there have been groupings made as the result of computer processing (e.g. Booth 1978*a*, *b*).

Pryor and Johnson (1971) informally classified all known eucalypt taxa within subgenera (which they defined) and gave each taxon a code which indicated its taxonomic position at a number of levels. Only recently have these groups been mapped (Ladiges and Humphries 1983, after Chippendale and Wolf (1981) who mapped distributions of individual taxa). We wished to extend the process by mapping taxon density within subgenera.

Interpretation of patterns in the genus was another aim in this investigation. Explanations were sought in relation to the sampling of the variation both geographically and taxonomically, and in relation to the current environment, especially climate.

Data

Our taxonomic data came from an updated (1982) version of the computer file of Chippendale and Wolf (1981) which listed the occurrence of taxa for all 541 of the 1:250 000 mapsheets of the Australian continent: 502 mapsheets had eucalypts present (Appendix 1). The file was drawn up from herbarium records of eucalypts throughout Australia. Another file, EUCALIST, also exists which lists localities (cf. mapsheets) for all specimens (cf. taxa). We used the

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former file for our classifications because of the convenience of the assembling of taxon lists according to locality, convenience of subsequent classification and because of the grid reference errors still to be corrected in EUCALIST. However, we did use EUCALIST to provide us with an indication of biases in the collection of data (see 'Methods').

Our taxa (Appendix 2) are those delimited by Chippendale in Chippendale and Wolf (1981): some are currently recognised as varieties rather than species, and some have not yet been described. For students of *Eucalyptus* this taxonomic uncertainty is not unusual. There continues to be debate about relationships from genus level through subgeneric levels (e.g. Ladiges and Humphries 1983) through to species and variety levels. New taxa continue to be named.

Choosing to use the Australian Map Grid of 1:250 000 mapsheets raises problems in some cases. Not all mapsheets cover an area exactly 1.0 × 1.5 degrees latitude by degrees longitude. Some are larger, e.g. Tasmanian mapsheets, while some have very little land (much water), e.g. Sale in Victoria. The larger mapsheets introduce problems of display in computer-generated output. For convenience Tasmania was split in some mapping routines. Where the areas of land and sea vary between mapsheets, a bias was introduced because of the varying chances of encountering species purely on the basis of sampling area.

Methods

(a) *Patterns in distributions of areas with similar taxa, of taxa with similar areal coverage and of taxa in various subgenera.*

A matrix recording the presence and absence of 551 taxa for the 502 mapsheet-districts (MSD) containing eucalypts was compiled. From this matrix, MSD were classified on the basis of similarity of eucalypt composition while taxa were grouped on the basis of similarity of their distributions. For generalisation, the objects to be classified were called 'individuals' and the descriptions applied to these were called 'attributes'. Associations between individuals were to be determined numerically and then individuals were to be grouped according to the closeness of these associations. For each calculation, a number of methods were available.

Even using simple presence/absence data, there was a wide choice available in selecting an appropriate measure of association (Cheetham and Hazel 1969, Hohn 1976, Huhta 1979). For two taxa, there are four possible combinations of presence or absence and thus four possible frequencies of occurrence indicated by convention with the first four letters of the alphabet (Table 1). In choosing the appropriate combination of frequencies of occurrences, a decision on the use of 'd' values (double absences) is primary. If 'd' values are used, then two individuals may be considered similar when they share many absences. Here, the use of 'd' values was considered inappropriate.

Two similarity measures (S) that omit the 'd' value are those of Jaccard (1908) — where $S = a/(a + b + c)$ — and Czekanowski (1913) — where $S = 2a/(2a + b + c)$. These are the presence/absence equivalents of the Canberra-metric (Lance and Williams 1966) and the measure of Bray and Curtis (1957) as used for 'quantitative' data. Unfortunately, the omission of 'd' also has its drawbacks. If two individuals have only one attribute in common, and neither has a unique attribute, the measure of association for these will be the same as that for two individuals having fifty attributes in common and no unique attribute. For the measure of association between MSD, the Czekanowski coefficient was used, thereby giving extra weight to mutual presences in our rather diffuse data set.

Table 1. Nomenclatural code for the frequency of occurrence of presence and absence of attributes of individuals 'i' and 'j'.

		Individual j	
		Present	*Absent*
Individual *i*	Present	a	b
	Absent	c	d

For the measure of association of taxa, a modification of the Bray and Curtis (1957) coefficient was used and combined with a subsequent step in an algorithm called TWOSTP (Belbin 1980). TWOSTP has been found to be particularly appropriate for the classification of taxa (Austin and Belbin 1982). The first step calculates the dissimilarity (D) between individuals 'i' and 'j' as: $D_{ij} = b/(2a + b)$; and between 'j' and 'i' as: $D_{ji} = c/(2a + c)$. In this way, emphasis is given to mismatches (b and c) in the data. D_{ij} and D_{ji} in TWOSTP are arranged as a matrix upon which the second step operates. This step determines the overall association by summing the differences between each pair of rows. This enables a measure of association between two taxa to be made in relation to all others in the data set.

Czekanowski and TWOSTP calculate the levels of association between individuals but do not group them. From among the range of grouping methods (Williams 1976), we chose an hierarchical technique in order to show the closeness of relationships at different levels. The hierarchy was achieved by agglomerative methods rather than divisive ones, since the latter mostly use single attributes to create dichotomies. However, agglomerative methods are not without problems as they can be computationally expensive and tend to make mistakes at higher levels of classification (Williams 1976).

Fusing individuals into groups and grouping the groups brings further methodological choices. We chose a middle path between the methods which tend to distance unclassified individuals from groups already formed and those which tend to draw such individuals into preformed groups, *viz.* the UPGMA fusion strategy (i.e. the *U*nweighted *P*air *G*roup arith*M*etic *A*verage) or 'group average' strategy (Sneath and Sokal 1973). Two individuals with the greatest association were first fused and then the level of association, S, between this group and all other individuals (or groups) was calculated by:

$$S_{ij.k} = (N_i * S_{ik} + N_j * S_{jk})/(N_i + N_j)$$

In this equation, $S_{ij.k}$ is the similarity coefficient of group 'ij' (being fused) with group 'k'; S_{ik} and S_{jk} are similarity coefficients of already formed groups; and N_i and N_j are the number of individuals in groups i and j respectively. The process is continued to completion and a dendrogram showing individuals and successive groups at various levels of fusion is produced.

The number of groups produced can vary from one to the number of individuals considered. Most subjective classifications choose between four and thirteen major groups (e.g. Keast 1981), numbers which provide a balance between synthesis and structure. We arbitrarily chose twenty-five groups of both MSD and taxa, anticipating that a number of them would be minor ones.

Groups of MSD and taxa were arranged on a large two-way table, a permutation of the rows and columns of the original data matrix, so as to reflect the ordering achieved by the analysis. This facilitated interpretation as did the production of maps.

Mapping of groups of MSD, *i.e.* zones, is straightforward but automated colour coding is not. A novel method was developed (Belbin *et al.* 1983). The average composition of each of the twenty-five zones (no. of presences/no. MSD) was used as the data matrix for the calculation of association measures (D) from that of Bray and Curtis (1957): $D_{ij} = \Sigma|X_{ik} - X_{jk}|/\Sigma (X_{ik} + X_{jk})$ where *i* and *j* are zones and X_{ik} and X_{jk} and the values for the average presence of taxon 'k'. Having calculated D_{ij}, these values were ordinated by principal co-ordinate analysis, or PCOA (Gower 1967) and the first (best) three components retained. These three axes were then replaced by colour axes represented by the three primary colours (yellow, magenta and cyan). In this way the co-ordinates of each zone could be represented by a colour coding such that zones near each other in PCOA space would be chromatically similar while those representing classification extremes would be chromatically different. Plotting was carried out on an *Applicon* colour ink-jet plotter with a sixteen-unit colour scale on each primary — giving a maximum of 16**3 or 4096 colours.

Taxa with similar distributions were mapped not only according to the extent of the distribution of the group but also according to the taxon density (i.e. taxa per MSD).

Interactions between zones and taxon groups were investigated in two ways. Firstly, the derived matrix of taxon groups and zones was used to calculate the 'saturation' value of each 'box'. This value was the total number of presences of all taxa in the taxon group across all MSD of the appropriate zone divided by the number of possible entries (the product of the number of taxa in the group and numbers of MSD in the zone) and expressed as a percentage. Secondly, maps of taxon groups were printed as transparencies and overlaid on the map of zones and the extent of overlap of the taxon group with the best-fit zone was measured and recorded. A measure of congruence of the maps was then equal to twice the number of overlapping MSD times 100 divided by the sum of the number of MSD for the taxon-group and those for the zone.

Taxon number per MSD was calculated for the genus *Eucalyptus* as a whole and for taxa within subgenera. Emphasis was placed on the latter because of the work of Chippendale (1981) on the former. *Eucalyptus* was considered not to include *Angophora* (Ladiges and Humphries 1983, cf. Pryor and Johnson 1971). Five subgenera were recognised in our data set: *Blakella, Corymbia, Eudesmia, Monocalyptus* and *Symphyomyrtus*. We followed Ladiges and Humphries (1983) in combining *Gaubaea* and *Idiogenes* with *Monocalyptus*.

(b) *Sampling*

Three types of 'sampling' may be distinguished. Firstly, there is the sampling of the actual taxonomic variation in the field and its classification into taxa. Changes here may be measured as the description rate of taxa. Secondly, the degree of sampling of distributions in the field (Sampling Index) may be indicated by the number of herbarium specimens per taxon per MSD. This was calculated from EUCALIST when the 82 568 records with given locations were removed from the total list of *ca.* 110 000. Thirdly, there is the problem of effective quadrat size. Many of the 1:250 000 mapsheets have areas of sea as well as land so their effective size is reduced. The impact of this was evaluated by comparisons of numbers of taxa in MSD found to be outliers, in the classification of MSD into zones, with adjacent MSD.

(c) *Environmental correlations*

Values of ten meteorological variables for locations in the centre of each MSD were made available to us by H.A. Nix and M. Hutchinson of CSIRO Division of Water and Land Resources. These values were interpolated or extrapolated from values derived from the scattered network of Australian meteorological stations (Australia, Bureau of Meteorology 1975).

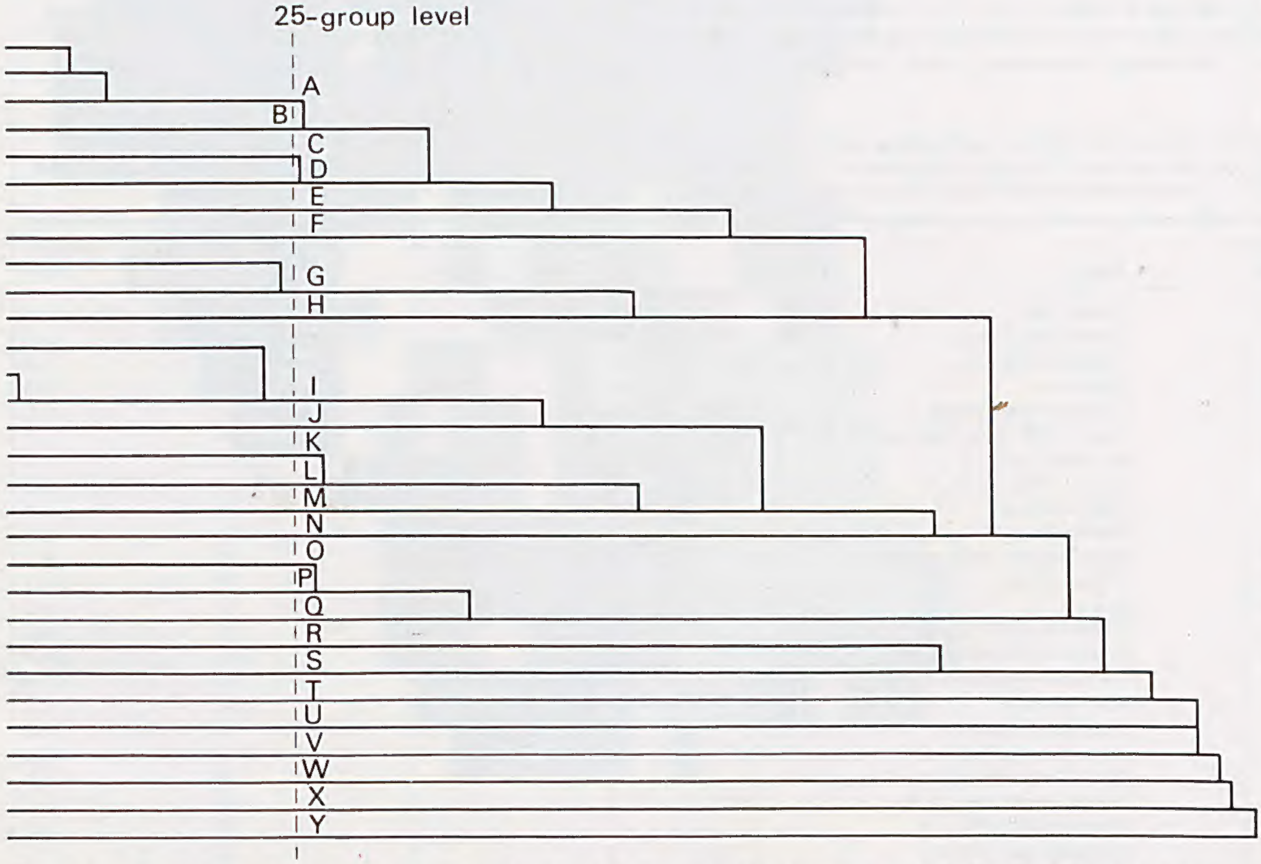


Figure 1. Classificatory dendrogram for mapsheet districts. Zones at the 25-group level are identified by capital letters. See Table 2 for details of the zones.

The ten variables were:

TEMPMEAN — mean daily temperature averaged for the year
TEMPMIN — mean minimum daily temperature of the coldest month
TEMPMAX — mean maximum daily temperature of the warmest month
TEMPWETQ — mean daily temperature averaged for the wettest three consecutive months
TEMPDRYQ — mean daily temperature averaged for the driest three consecutive months
RAINMEAN — average annual rainfall
RAINMIN — minimum average monthly rainfall
RAINMAX — maximum average monthly rainfall
RAINWETQ — total average rainfall for the three wettest consecutive months
RAINDRYQ — total average rainfall for the three driest consecutive months

Rainfalls were in mm and temperatures in °C. Average values for each variable were calculated for each zone and correlations between variables were sought using linear regressions. For taxon groups and subgeneric groups, the same procedure was followed except that averages were weighted according to the number of taxa found in each MSD:

$$\text{Weighted average} = (\sum_{i=1}^{i=M} V_i * Q_i)/[(\sum_{i=1}^{i=M} Q_i)]$$

where V_i is the value for the i th mapsheet, Q_i is the number of taxa in the mapsheet and M is the total number of mapsheets in which taxa occur.

For all subgeneric groups together, the extent of any correlation between numbers of taxa and drought was sought. Using the map of Walker (1981, Fig. 7) for zones with various lengths of dry periods and superimposing data for taxon density onto it, the average taxon density per dry-period zone was calculated. Walker's zone 10 was very small (1 MSD) so it was combined with his zone 9.

Results

(a) *Zones*

The classificatory dendrogram for the placement of MSD into zones is shown in Fig. 1 from the 30-group level to complete aggregation: our focus was on the 25-group level. The 25 groups were mapped (Fig. 2) according to PCOA and colour matching. The zones were generally of contiguous MSD. The eleven major zones (> 5 MSD in area) occupied 95% of the area of Australia in which *Eucalyptus* has been recorded. The largest zone was spread throughout arid Australia and comprised 161 MSD: the smallest zones had only 1 MSD (e.g. Warri in Western Australia). All the zones were labelled with a capital letter according to their position on the dendrogram (Table 2 and Appendix 3).

Major zones were arranged around three sides (not the western) of the large arid-region zone A. To the north was zone C while to the north-east was zone D. A small central Queensland (Qld) zone (B) occupied a small part of the boundary between zone A and D. Zones A, B and C were all designated in shades of green thereby suggesting affinity with one another. Zone D was mapped in brown suggesting some affinity with the south-east where zones were reddish coloured, e.g. zones I, O and P. Zone I spread from the south-east across the Great Australian Bight where it joined the south-western zones of blue shadings. The scattering of zones mapped with blue colourings through the western arid area, in addition to the predominant blue of the south-western zones K and L, suggested that the affinities between the south-western and arid zones were stronger than with zones to the east (e.g. zone I).

Classificatory affinities can be derived from an analysis of the dendrogram (Fig. 1). At the 24-group level, the northern zone, C, and main north-eastern zone, D, united. The central Queensland zone, B, was added at the 23-group level to the central arid group, A, and these zones combined with the

Table 2. Zones produced by the classification at the 25-group level together with numbers of mapsheet districts (MSD) per zone, numbers of taxa per zone, numbers of endemic taxa per zone and the average sampling index for the zone. Zones > 5 MSD in area are shown with an asterisk. 'n.d.' = not determined because sample size too small (i.e. ≤ 5 MSD).

Group code	*Name*	*No. of MSD*	*No. of taxa*	*No. of endemics*	*Av. sampling index*
A*	Central arid	161	63	6	4.8
B*	Central Queensland	10	13	0	2.6
C*	Northern Australia	68	80	21	6.0
D*	North-east	48	130	31	6.3
E	Scattered north central	5	11	0	n.d.
F*	Scattered Western Australia	9	10	0	3.3
G*	Sir Samuel area	15	30	0	5.2
H	Bentley–Wilson, W.A.	2	4	0	n.d.
I*	Bight and east	75	97	15	11.5
J	Naretha only (W.A.)	1	1	0	n.d.
K*	South-western (main group)	33	167	75	9.1
L*	Albany–Perth	8	56	5	10.1
M	Cue	4	7	0	n.d.
N	Childara only (S.A.)	1	2	0	n.d.
O*	South-eastern (main group)	31	220	111	14.9
P*	Tasmania–Western Victoria	18	73	19	17.8
Q	Sale only (Vic.)	1	9	0	n.d.
R	Abrolhos–Shark Bay	5	16	1	n.d.
S	Rottnest only (W.A.)	1	1	0	n.d.
T	Turee Creek only (W.A.)	1	1	0	n.d.
U	Medusa Banks only (N.T.)	1	2	0	n.d.
V	Westwood only (W.A.)	1	1	0	n.d.
W	Loongana only (W.A.)	1	1	0	n.d.
X	Irwin Inlet only (W.A.)	1	3	0	n.d.
Y	Warri only (W.A.)	1	1	1	n.d.

1:250 000 MAPSHEETS VIA EUCALYPTS (CZEK+UPGMA)

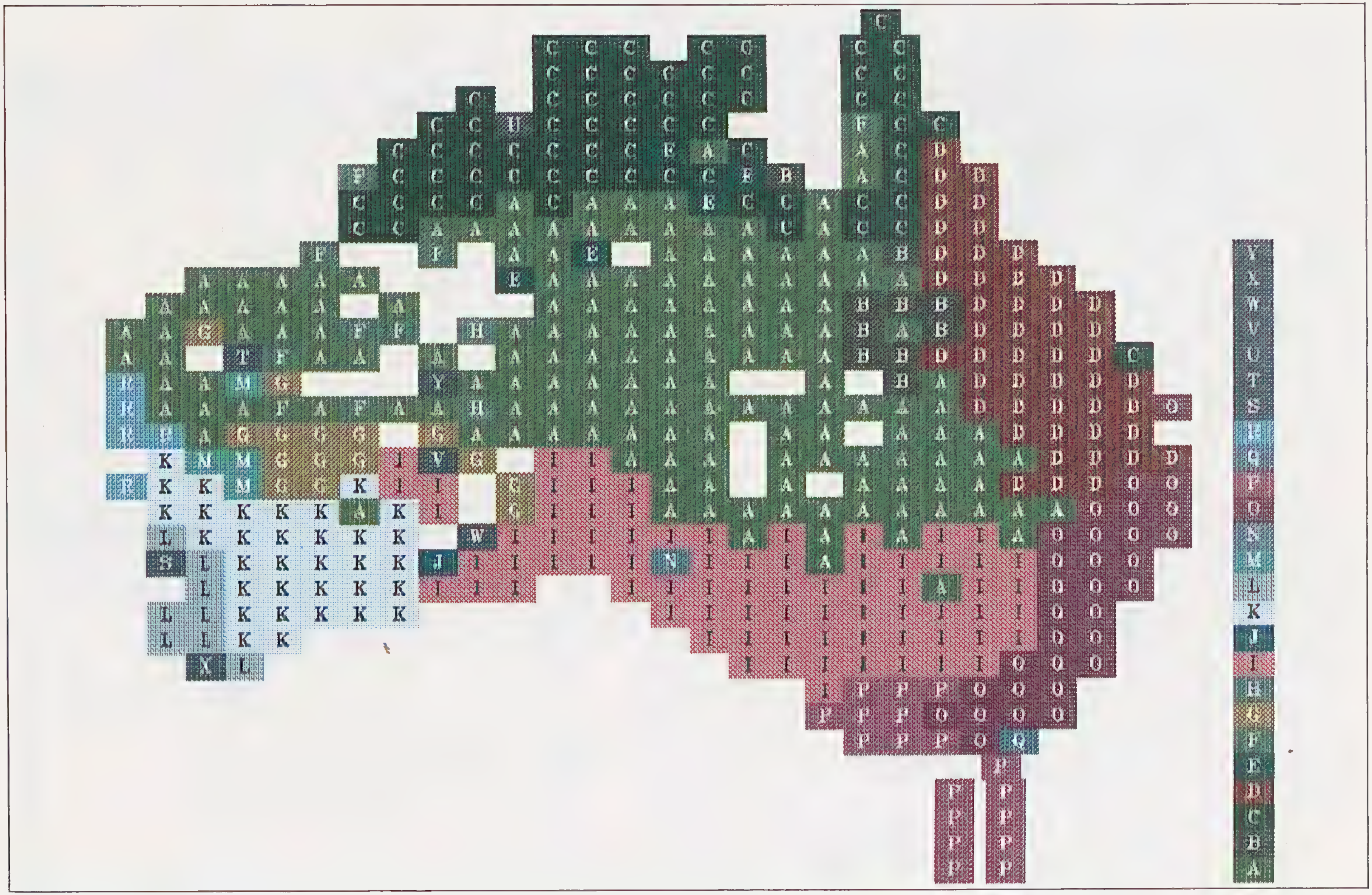


Figure 2. Zones of Australia with similar taxon-composition at the 25-group level.

(C+D) zone at the 20-group level. In the south-east, the Tasmania–western Victorian zone, P, joined the south-eastern zone, O, at the 22-group level. In the south-west of Western Australia (W.A.), the Albany–Perth zone, L, joined the main south-western group, K, at the 21-group level. At the 20-group level, then, there was a large northern zone (A + B + C + D) north of latitude 29°S (approximately), a moderately-sized south-western zone (K + L), a moderately-sized south-eastern zone (O + P) and a major southern zone (I). Together, these 5 groups occupied 90% of the total *Eucalyptus* zone.

At lower levels of fusion (i.e. > 25 groups), subgroups within some of the major groups became apparent while others were unchanged even at the 35-group level (e.g. zones C, D except for 1 MSD, K, L and P formed early and remained the same to the 25-group level). At the 27-group level a north-of-Nullarbor zone distinguished itself from zone I. Some small and scattered groups were separated from the large arid zone, A, at the 28- and 29-group levels. It was not until the 35-group level that a *block* of MSD were found to be separated as a group: this occurred in zone O when the north-eastern portion (including Wide Bay and the 8 MSD from Newcastle north to Warwick and from Coffs Harbour north to Tweed Heads) was found to separate. The Tasmania–western Victorian zone, P, divided at the 43-group level to produce a mainland area and a Tasmanian (Tas.) area which included the islands of Bass Strait.

It was noteworthy that many of the smaller groups remained as separate MSD up to at least the 20-group level. Examples were all ten of the single MSD zones at the 25-group level — Naretha (J), Childara (N), Sale (Q), Rottnest (S), Turee Creek (T), Medusa Banks (U), Westwood (V), Loongana (W), Irwin Inlet (X) and Warri (Y) — and the small Abrolhos–Shark Bay (R) and Cue (M) groups.

The numbers of taxa present in each zone are listed in Table 2. The largest zones did not have the most taxa. The central arid zone, A, had 161 MSD but only 62 taxa (an average of 0.4 taxa per MSD) whereas the 31 MSD in the south-eastern region had 220 taxa (an average of 7 taxa per MSD). There was no statistically significant linear correlation between the numbers of MSD in a zone and the number of taxa found there for the 11 larger groups: a logarithmic transformation of the data did not cause the correlation coefficient to reach statistical

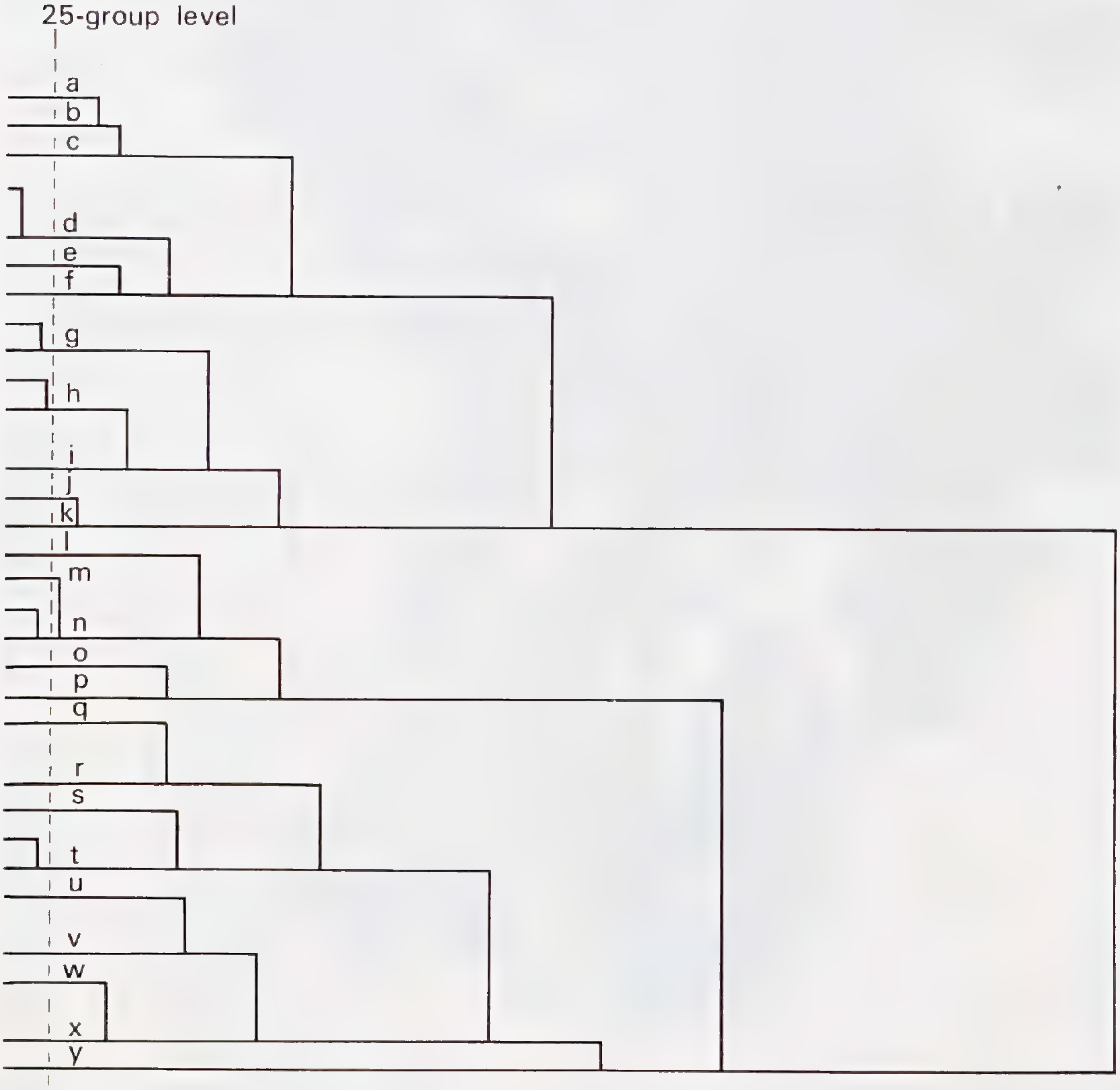


Figure 3. Classificatory dendrogram for taxa. Taxon groups at the 25-group level are identified by lower-case letters. See Tables 3 and 4 for details of the group.

significance. Most taxa were found in the south-eastern, south-western and north-eastern zones (O, K and D respectively).

Taxa endemic to particular zones (Table 2) varied in number from zero to 100%, the latter being for *E. rameliana* in Warri, W.A. Numbers of endemic taxa per zone (y) were related to the total taxa per zone (x) in a simple quadratic: $y = 0.0023\ (x^2 + x) - 0.19$. In this equation $N = 25$, $r^2 = 0.98$, $P < 0.001$. The relationship betweeen the numbers of endemic taxa per zone and the numbers of MSD present was more complex with zones of around 30–35 MSD having the greatest number of endemics while both larger and smaller zones had fewer.

(b) *Taxon groups*

Taxon groups are groups of taxa with similar distributions. Overall, individual taxa occupied vastly different areas, most of them being small. Thus, 96% of taxa had distributions covering less than 50 MSD, an area *ca.* 10% of the maximum possible. More than 50% of taxa had distributions covering less than 10 MSD. At the other end of the scale was *E. camaldulensis* with a distribution of 245 MSD.

The dendrogram defining the groups is shown in Fig. 3 to the 30-group level. The groups designated at the 25-group level by a lower case letter (Appendix 4) are described in Tables 3 and 4 where the main features of distribution and composition are given. Fig. 4 (*a* to *y*) is a series of maps of the distributions of all the groups (from *a* to *y*).

Proportions of taxa found in various subgenera (Table 3) are of greatest value when taxa per taxon-group are most numerous. Overall, the frequency of taxa by subgenus was: *Blakella*, 2%; *Corymbia*, 7%; *Eudesmia*, 3%; *Monocalyptus*, 21%; *Symphyomyrtus*, 66%. 'Significant' departures from these frequencies are outlined below.

Group *a* was outstanding for the number of taxa present (101 or 18% of total) and the area it occupied (443 MSD or 88% of maximum possible). Prominent taxa in this group were *E. camaldulensis* and *E. microtheca*, both of which belong to the subgenus *Symphyomyrtus*. *Monocalyptus* was conspicuously absent from this group while *Blakella*, *Corymbia* and *Eudesmia* were found in proportions much greater than average. Group *a* had a concentration of taxa in the Katherine, Northern Territory (N.T.) area, but high densities of taxa were found through to the Kimberley area of W.A. A secondary node of relatively high taxon density was found in the Alice Springs area. The group was absent from the south-eastern coast (from near Brisbane, Qld, to western Victoria and Tas.) and from south-western Australia. It was the only taxon group present across about 50% of the country *viz.* most of N.T., the northern half of W.A., northern South Australia (S.A.) and western Qld: elsewhere, groups had overlapping distributions.

Groups *b*, *c* and *d* had generally complementary distributions and only small overlaps. Group *b* stretched from Esperance, W.A., eastwards along the coast to the 'lower' south-east of S.A. and inland from the Great Australian Bight to Forbes, New South Wales (N.S.W.): peak taxon density was in the Barker, S.A. area. Group *d* was a northward extension of the eastern end of group *b*. It occupied much of N.S.W. and eastern Qld and was centred in Springsure, Qld, where half of the 54 taxa of the group were present. Group *c* occupied most of Victoria (Vic.) and Tas. and had its greatest density of taxa across central Tas. Groups *b* and *c* had similar numbers of taxa (22 and 20 respectively) and similar peak densities (16 and 17 respectively). Prominent taxa in group *b* were mallee eucalypts while those of groups *c* and *d* were of open-forest and woodland types. Groups *b* and *c* had no members of *Blakella*, *Corymbia* and *Eudesmia* while group *d* had a relative abundance of taxa of *Corymbia*.

Groups *e* and *f* were both small and found in south-eastern Qld. Other small groups were *k* in W.A., *p* in the New England area of N.S.W., *s* in the Bega–Canberra area of N.S.W. and Australian Capital Territory (A.C.T.), *v* in north-eastern N.S.W., *x* in coastal N.S.W. and *y* in Dubbo, N.S.W. All these groups had distributions ≤ 5 MSD or had taxa ≤ 5.

In south-western Australia, groups *g*, *i* and *j* had

Table 3. *Taxon-groups.* Groups produced at the 25-group level, their main geographic distributions, numbers of taxa present, maximum taxa per mapsheet district present and the location of the district. Also, the distribution of taxa according to subgenus is shown: *gaubaea* and *Idiogenes* were combined with *Monocalyptus* (M). B is *Blakella*; C is *Corymbia*; E is *Eudesmia*; and S is *Symphyomyrtus*. Main groups are shown by *.

			Maximum taxon density		*Percentage*				
Group code	*Main distribution*	*No. of taxa*	*No. per MSD*	*Location i.e MSD*	*B*	*C*	*E*	*M*	*S*
a*	Widespread: not in SW nor coastal SE & Tas.	101	36	Katherine N.T.	7	19	8	0	65
b*	South Central & SE Australia not east coast	22	16	Barker S.A.	—	—	—	14	82
c*	Tasmania–Victoria	20	17	Oatlands, Queenstown (Tas.)	—	—	—	35	65
d*	Eastern Qld, Central N.S.W.	54	27	Springsure Qld	4	20	2	15	59
e	SE Qld	2	2	Chinchilla Qld	—	—	—	—	100
f	Gympie Qld	1	1	Gympie Qld	—	—	—	100	—
g*	WSW Aust. plus outlier north of Bight	37	19	Moora W.A.	—	8	14	22	57
h*	Southern Aust., not Vic. or Tas.	61	43	Newdegate W.A.	—	—	2	—	98
i*	Goldfields W.A.	24	15	Norseman W.A.	—	—	—	4	96
j*	S coast W.A.	33	20	Bremer Bay W.A.	—	—	—	36	61
k	Malcolm W.A.	1	1	Malcolm W.A.	—	—	—	—	100
l*	NE N.S.W., SE Qld	33	27	Dorrigo N.S.W., Warwick Qld	—	3	—	42	55
m*	E Aust.	8	8	Ipswich Qld, Tweed Heads N.S.W.	—	13	13	38	38
n*	NE Aust.	14	14	Brisbane Qld, Newcastle N.S.W.	—	14	—	21	64
o*	Subcoastal SE Aust.	10	10	Goondiwindi, Warwick Qld	—	—	—	—	100
p	New England	2	2	Manilla N.S.W.	—	—	—	50	50
q*	SE Aust.	31	28	Canberra A.C.T.	—	—	—	39	61
r*	Sydney–Melbourne	25	22	Canberra, Ulladulla N.S.W.	—	—	—	52	48
s	Bega, Canberra	7	5	Bega N.S.W.	—	—	—	43	57
t*	Canberra–Adelaide, Tas.	20	12	Bairnsdale Vic.	—	—	—	25	75
u*	E N.S.W.	8	8	Sydney N.S.W.	—	—	—	13	75
v	NE N.S.W.	5	5	Singleton N.S.W.	—	—	—	—	100
w*	E N.S.W.	20	20	Singleton N.S.W.	—	5	—	60	35
x	Coast N.S.W.	11	8	Wollongong	—	—	—	82	8
y	Dubbo N.S.W.	1	1	Dubbo	—	—	—	100	—

overlapping distributions. The major part of group *g* was centred on Moora near the west coast. A small disjunct area of group *g* occurred north of the Great Australian Bight. Group *i* in the eastern goldfields region of W.A. overlapped the eastern part of the major group *g* area. Group *j* occurred along the south coast with a peak density of 20 taxa in Bremer Bay. Each of these groups, *g*, *i* and *j*, had moderate numbers of taxa *viz*. 37, 24 and 33 respectively. Prominent taxa in all these groups were from *Symphyomyrtus* and were usually mallees. Group *g* was rich in taxa of *Eudesmia* while group *i* had an overwhelming proportion (96%) of taxa of *Symphyomyrtus*.

Group *h* had a large number of taxa (61), and covered a wide area (123 MSD) across southern Australia from the Indian Ocean, across the Bight, and into south-eastern S.A. and south-western N.S.W. The Newdegate, W.A., MSD had the most taxa (43) of this group. The core of greatest taxon density was found in the Western Australian portion of this group's distribution. Prominent taxa in this group were mallees (*E. oleosa*, *E. gracilis* and *E. foecunda*). Taxa were overwhelmingly (98%) of subgenus *Symphyomyrtus*.

Straddling the N.S.W.–Qld border was group *l* of 33 taxa found in greatest density (27 taxa per MSD) in Dorrigo, N.S.W. and Warwick, Qld. The distribution occupied 29 MSD. *E. moluccana* subsp. *moluccana* and *E. bancroftii* were prominent members — both from the subgenus *Symphyomyrtus*. However, *Monocalyptus* was well represented among the taxa (42%) as a group.

Groups *m* and *n* had similar distributions along the eastern coastline of Australia, had similar numbers of taxa (8 and 14 respectively) and had similar locations for maximum taxon density (across the Qld–N.S.W. border in both cases). Both groups had twice the average proportion of *Corymbia*. Group *m* had nearly four times the average representation of *Eudesmia* in *Eucalyptus*.

The taxa of group *o* were located in an eastern inland belt from southern Qld south to northern Vic. thence to eastern S.A. The centre of taxon density was on the Qld–N.S.W. border where all 10 taxa of the group were found (*viz*. in the MSD of Goondiwindi and Warwick). All taxa in this group belonged to the subgenus *Symphyomyrtus*.

Groups *q*, *r* and *t* were all of moderate numbers of taxa (31, 25 and 20 respectively) found in south-eastern Australia (including Tas.). Group *q* had a much wider distribution (79 MSD) than *r* and *t* (26 and 34 MSD respectively). The Canberra MSD had maximum densities of taxa for both *q* and *r* while Bairnsdale had this property for group *t*. Each of these groups had taxa only from the subgenera *Symphyomyrtus* and *Monocalyptus* but the ratios between them differed: they were 1.6, 0.9 and 3.0 for *q*, *r* and *t* respectively.

Maximum taxon densities for groups *u*, *v*, *w* and *x* all occurred in eastern N.S.W. Of these *v* and *x* had very restricted distributions (5 MSD only) and will not be considered further. Group *u* had maximum taxon density in the Sydney MSD while group *w* had maximum density at nearby Singleton: both groups had small distributions of 15 and 14 MSD respectively. Group *u* had 8 taxa; *w* had 20.

From this resumé, it was apparent that most taxon groups were found in eastern and southern Australia. Eleven groups overlapped in the Singleton MSD. In general, the numbers of taxon groups per MSD declined from this area dropping gradually toward the north and to the south and east (in a crescent following the coastline of the mainland). From Singleton to the north-west, the gradient was relatively steep. South-western Australia had, in general, 2–4 taxon groups per MSD.

Taxon groups had distributions of generally contiguous MSD's but disjunctions of more than 1 MSD did occur in some. The case of group *g* in south-western Australia has already been mentioned. Group *r* had an outlier from the mainland of 3 MSD in Tasmania. Group *t* had a similar disjunction. Group *x* had a northern outlier at Grafton. An outlier to group *w* occurred as 2 MSD in south-eastern Qld. Group *d* had the greatest disjunction of all: the MSD of Alice Springs and Hermannsburg, N.T., were an outlier to the group's main distribution in eastern Qld.

(c) *Zone/taxon-group saturations and congruences*

The matrix of taxon groups by zones showed that presences of taxa were highly clumped into a few of the 25*25 (= 625) 'boxes' available. These boxes were of different sizes so the results were expressed as percent presences (% presence = 100(p/tz) where p = no. present, t = potential no. taxa in box, and z = potential no. MSD in box). Values varied from nil to 54%.

(Text continues page 21)

Table 4. Taxa with widespread distributions relative to the distribution of the taxon group.

Group code	*MSD per group*	*Prominent taxa (with Pryon and Johnson code and number of MSD occupied)*
a*	443	*E. camaldulensis* (SNEEPA, 245), *E. microtheca* (SUADFA, 176)
b*	59	*E. dumosa* (SLE:GA, 40), *E. porosa* (SUNCC, 28)
c*	22	*E. nitida* (MATEJ, 17), *E. globulus* subsp. *globulus* (SPIFL, 14)
d*	13	*E. tessellaris* (BAA:A, 53), *E. melanophloia* (SUP:V, 52)
e	6	*E. panda* subsp. *panda* (SUV:G, 6), *E. argophloia* (SUNAA, 1)
f	1	*E. conglomerata* (MAHEJ, 1)
g*	47	*E. oldfieldii* (SIVEH, 17), *E. ewartiana* (SIVEA, 16)
h*	123	*E. oleosa* var. *oleosa* (SIT:C, 72), *E. gracilis* (SIX:A, 67), *E. foecunda* (SIZ:B, 67)
i*	23	*E. lesouefii* (SLE:N, 12), *E. comitaevallis* (SLI:G, 11)
j*	15	*E. cornuta* (SICBA, 9), *E. lehmannii* (SICBE, 8), *E. decurva* (SIP:B, 8)
k	1	*E. discreta* (SIZ:F, 1)
l*	29	*E. moluccana* subsp. *moluccana* (SUL:B, 16), *E. bancroftii* (SNECE, 14)
m*	81	*E. tereticornis* (SNEEB, 65), *E. crebra* (SUP:S, 59)
n*	62	*E. siderophloia* (SUP:I, 32), *E. eugenioides* (MAHEA, 29)
o*	63	*E. microcarpa* (SUL:DB, 43), *E. dealbata* (SNEEJ, 31)
p	4	*E. mckieana* (MAHER, 3), *E. malacoxylon* (SPIDCB, 2)
q*	79	*E. melliodora* (SUX:A, 51), *E. viminalis* (SPIKKA, 47)
r*	26	*E. dalrympleana* subsp. *dalrympleana* (SPINCA, 19), *E. sieberi* (MAKED. 12), *E. consideniana* (MAKEA, 12)
s	2	*E. paliformis* (MAKIM, 2); all other taxa (MA or SP, 1)
t*	34	*E. baxteri* (MAHCAA, 18), *E. delegatensis* (MAKBE, 13)
u*	15	*E. amplifolia* (SNEEA, 13), *E. quadrangulata* (SPIHA, 9)
v	5	*E. glaucina* (SNEEC, 4), *E. largeana* (SUDAA, 4)
w*	14	*E. punctata* (SECEDA, 9), *E. blaxlandii* (MAHCD, 8)
x	5	*E. ligustrina* (MAHEQ, 4), *E. luehmanniana* (MAKDB, 3), *E. piperita* subsp. *piperita* (MATHAC, 3)
y	1	(MAHEI, 1)

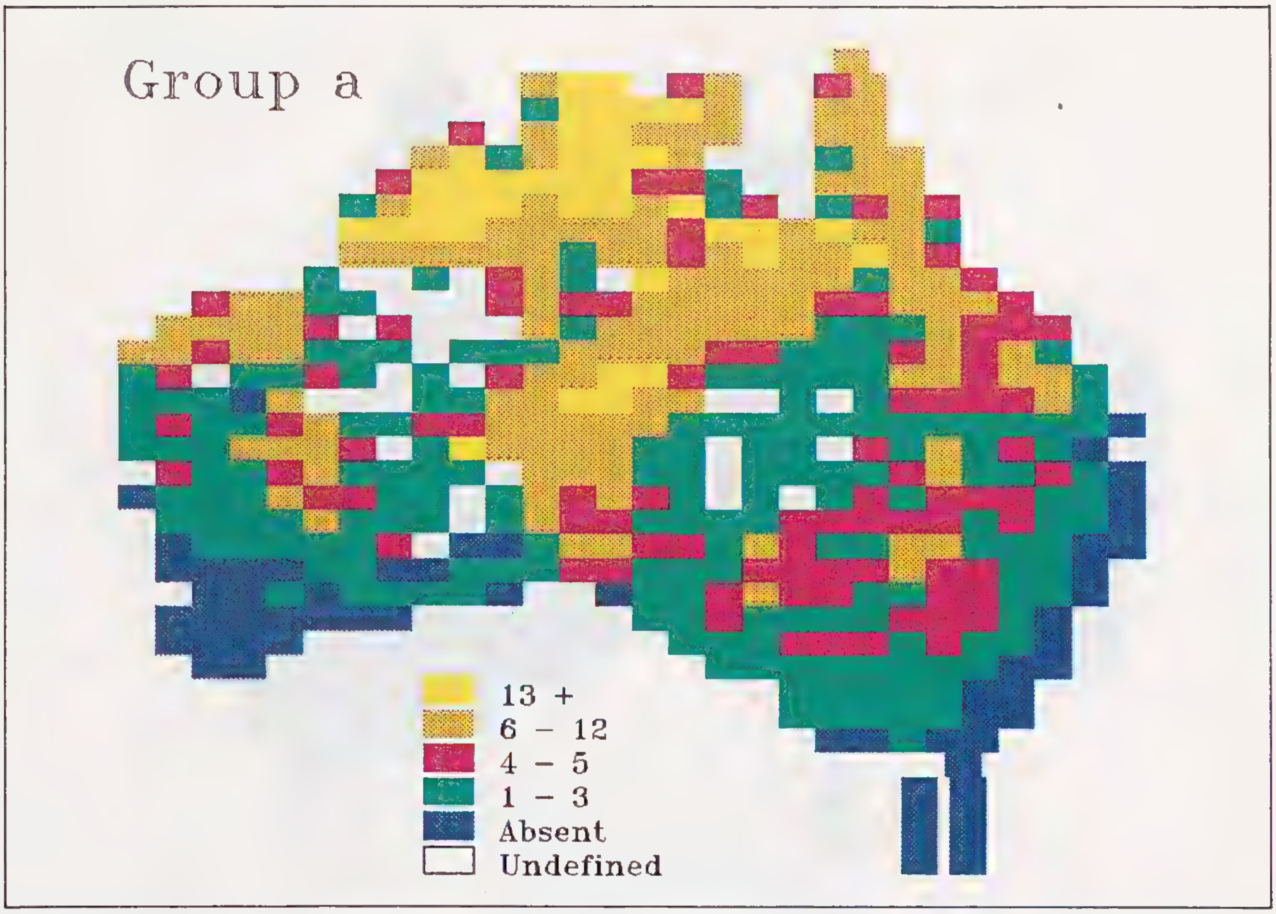
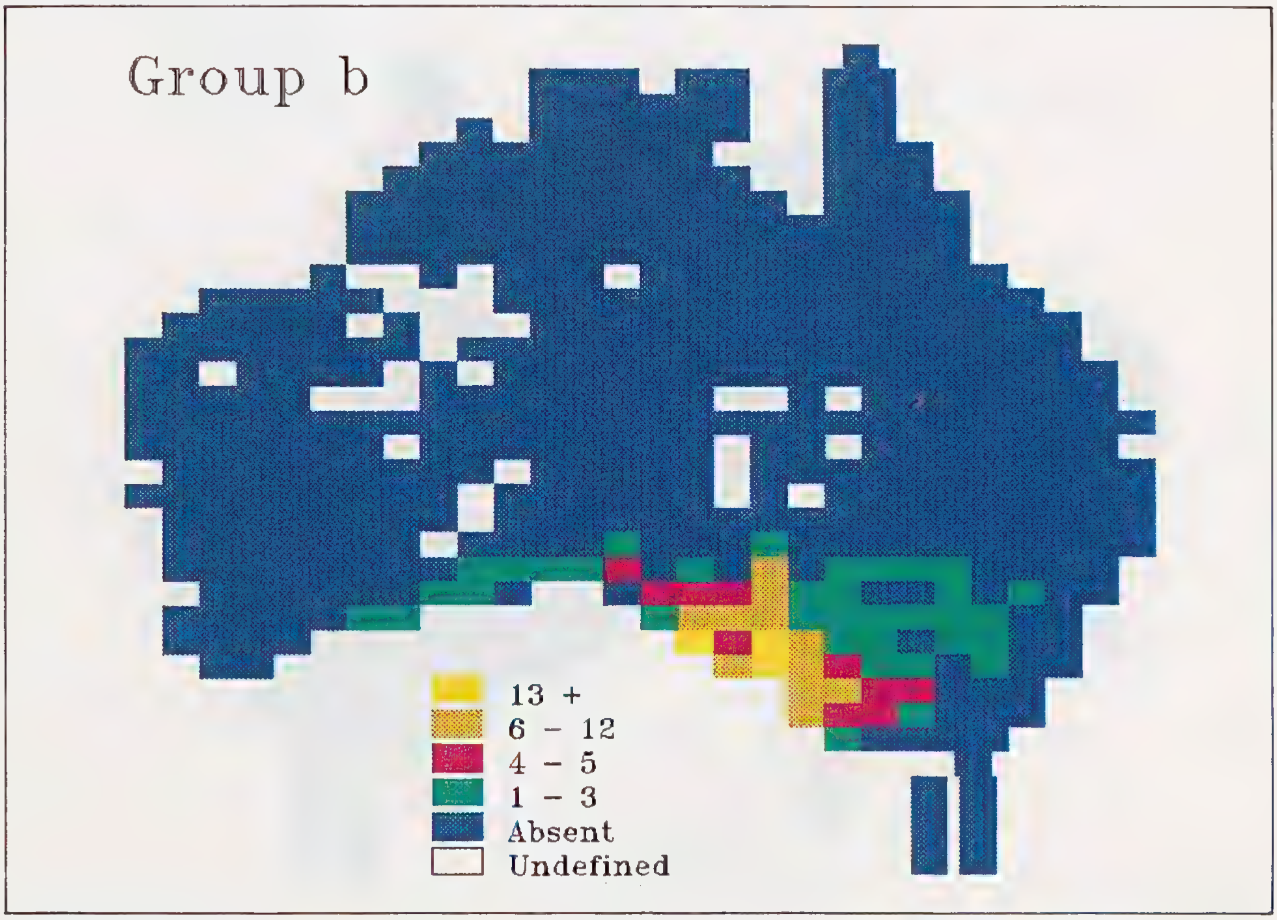


Figure 4. Maps showing the distributions of taxon groups with colours representing relative taxon density within each group.



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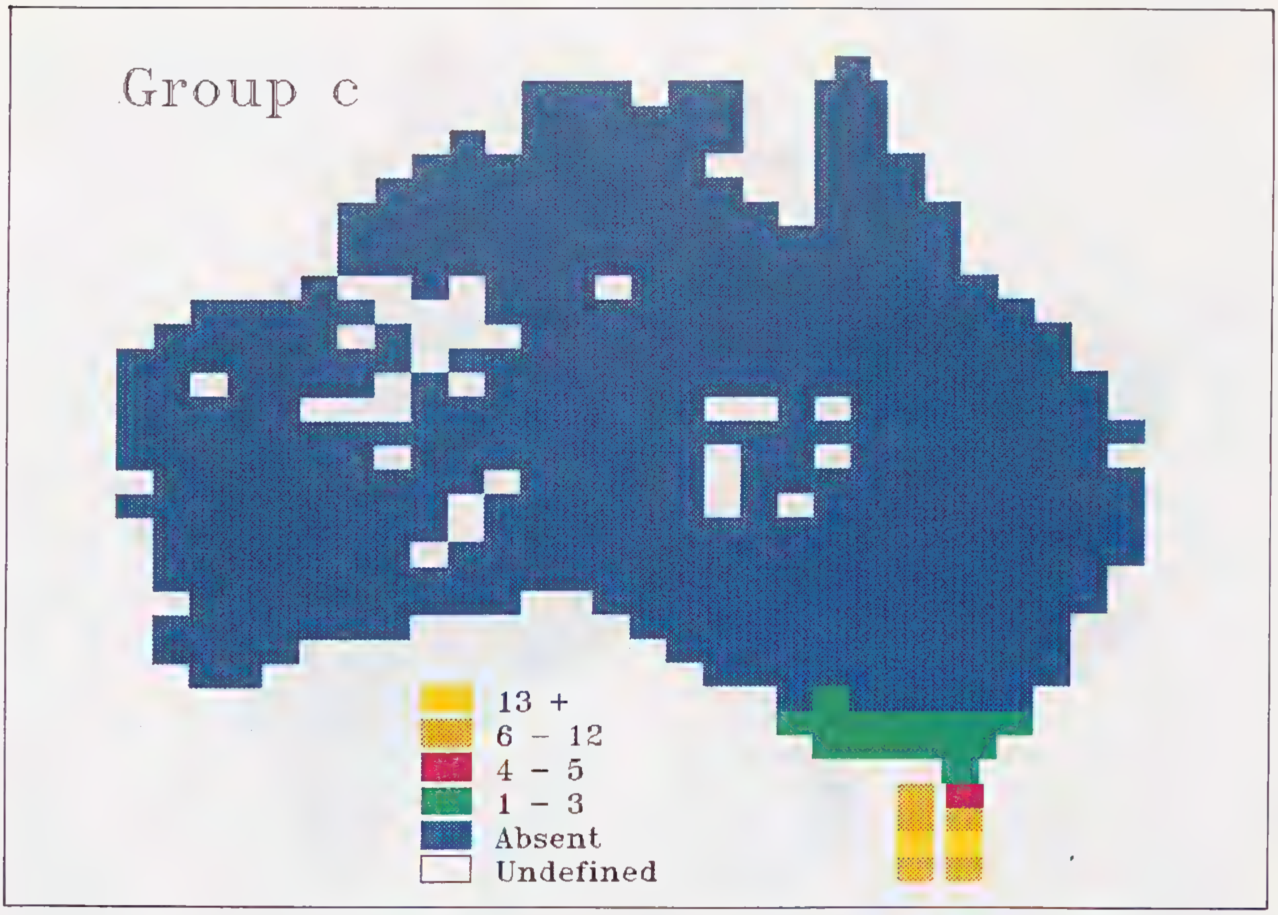

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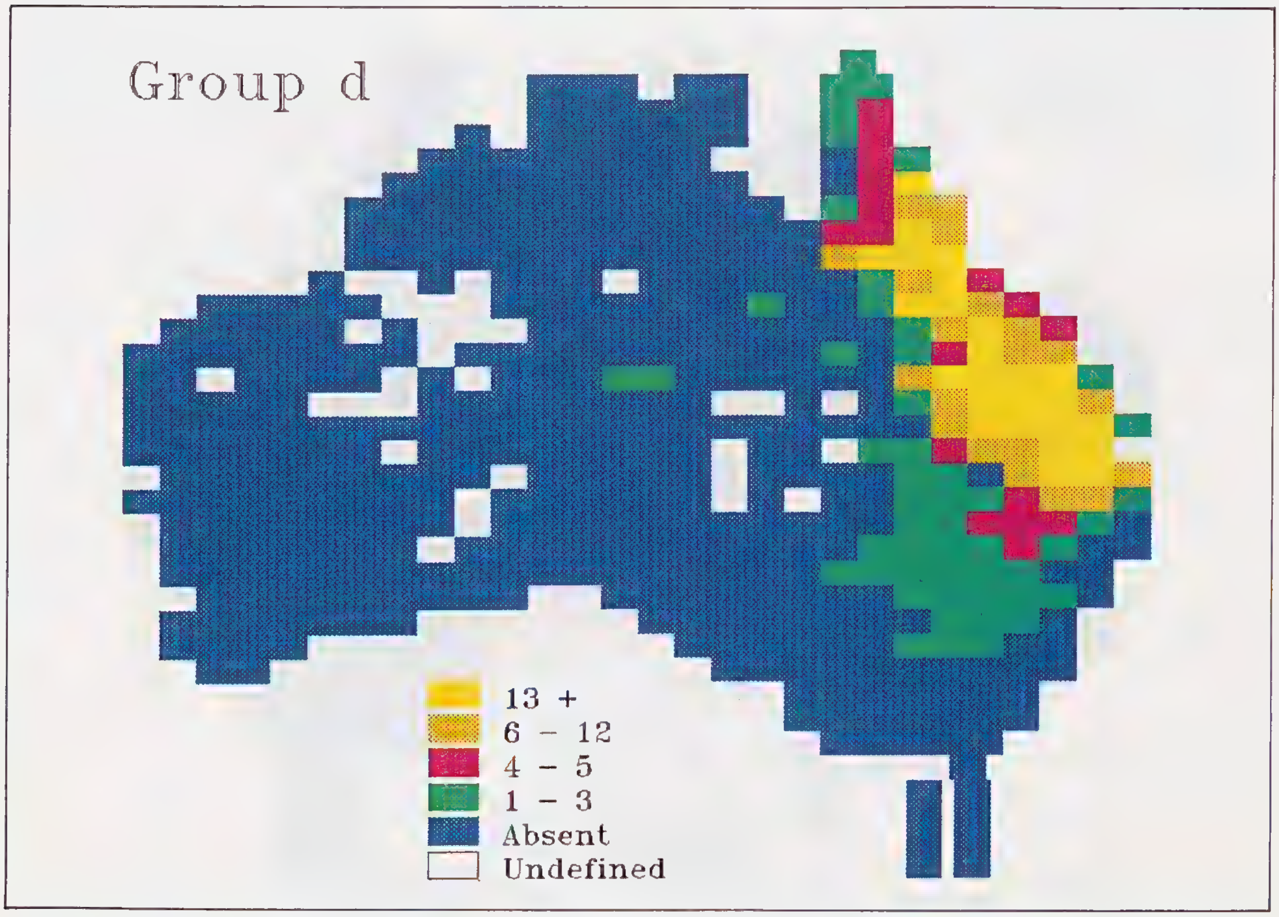

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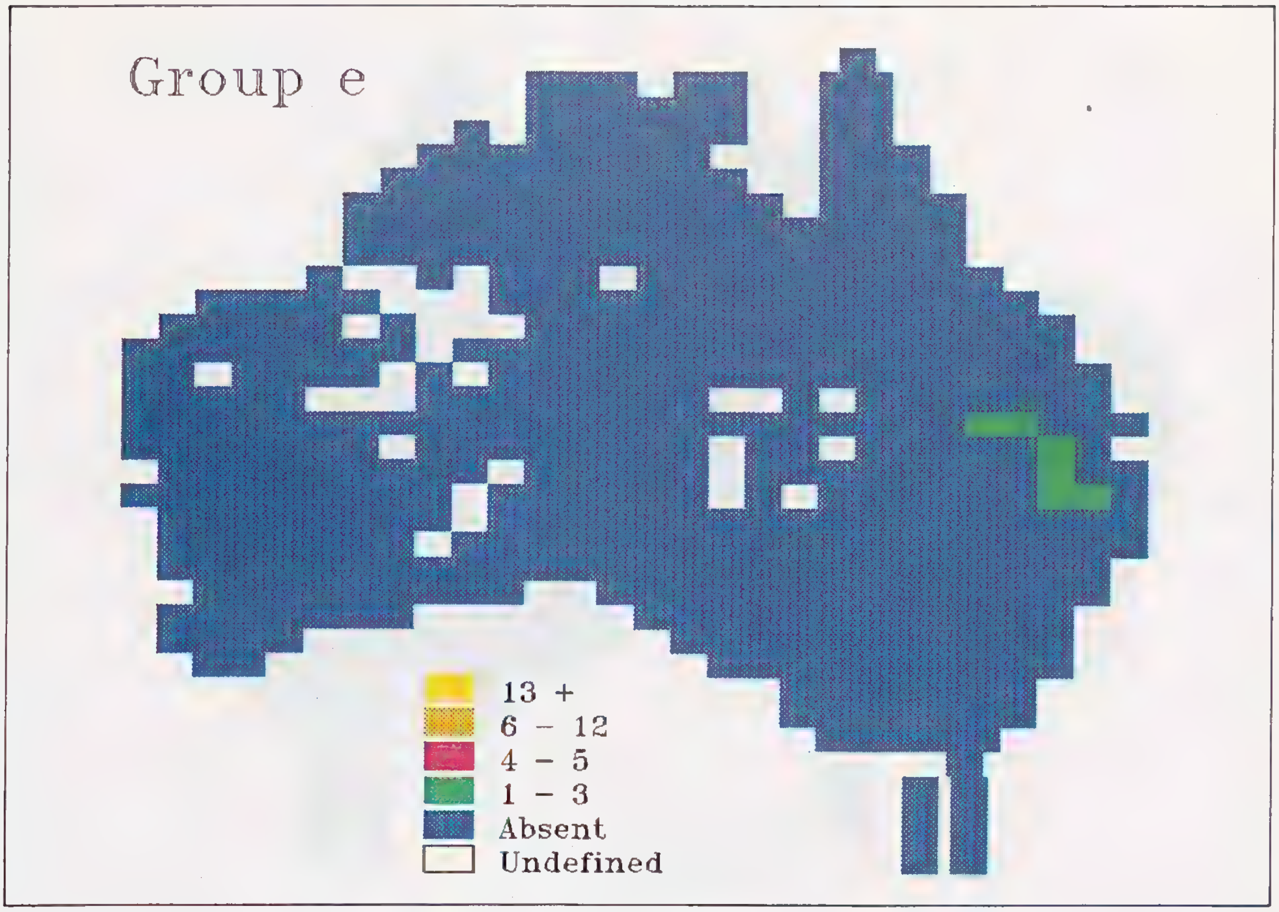

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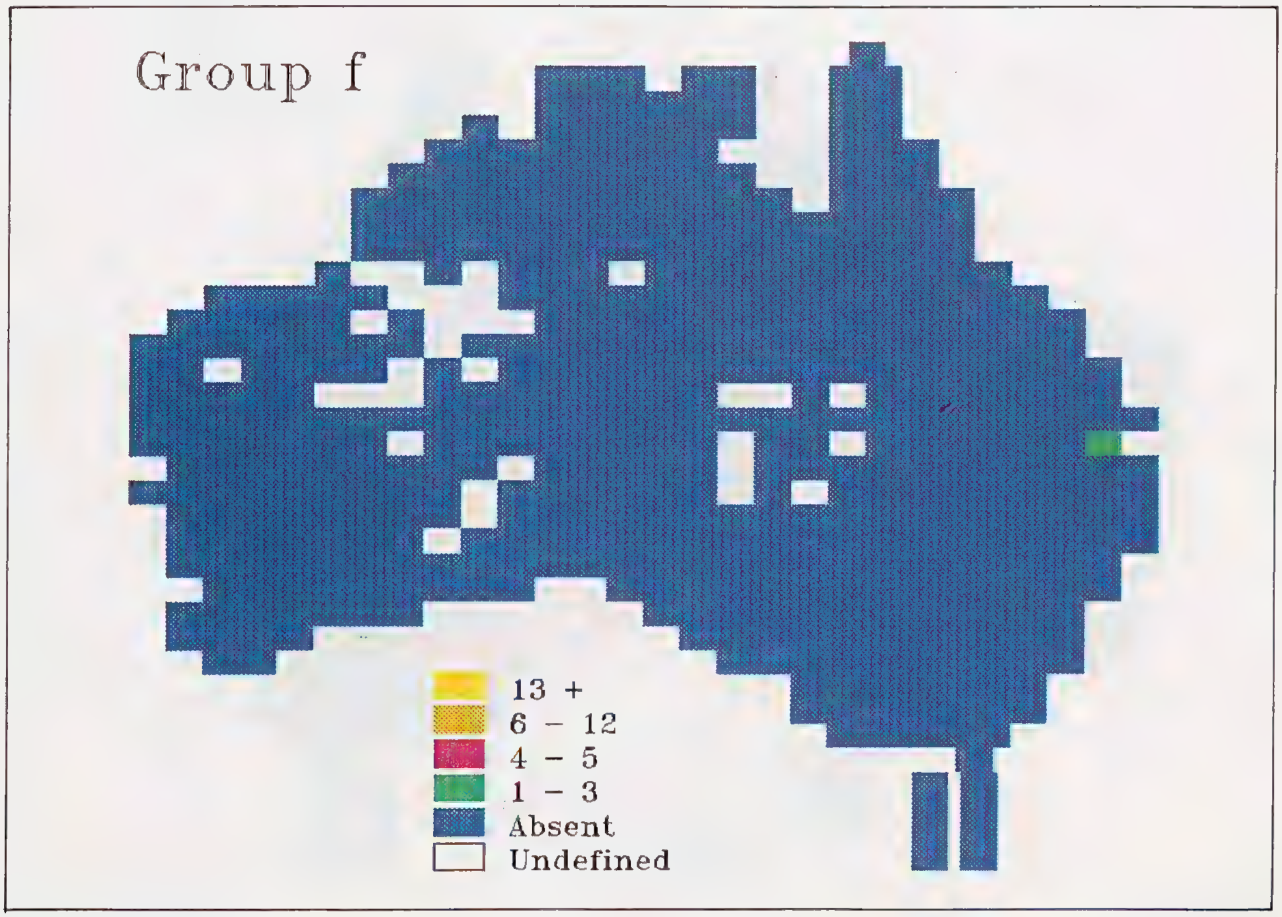

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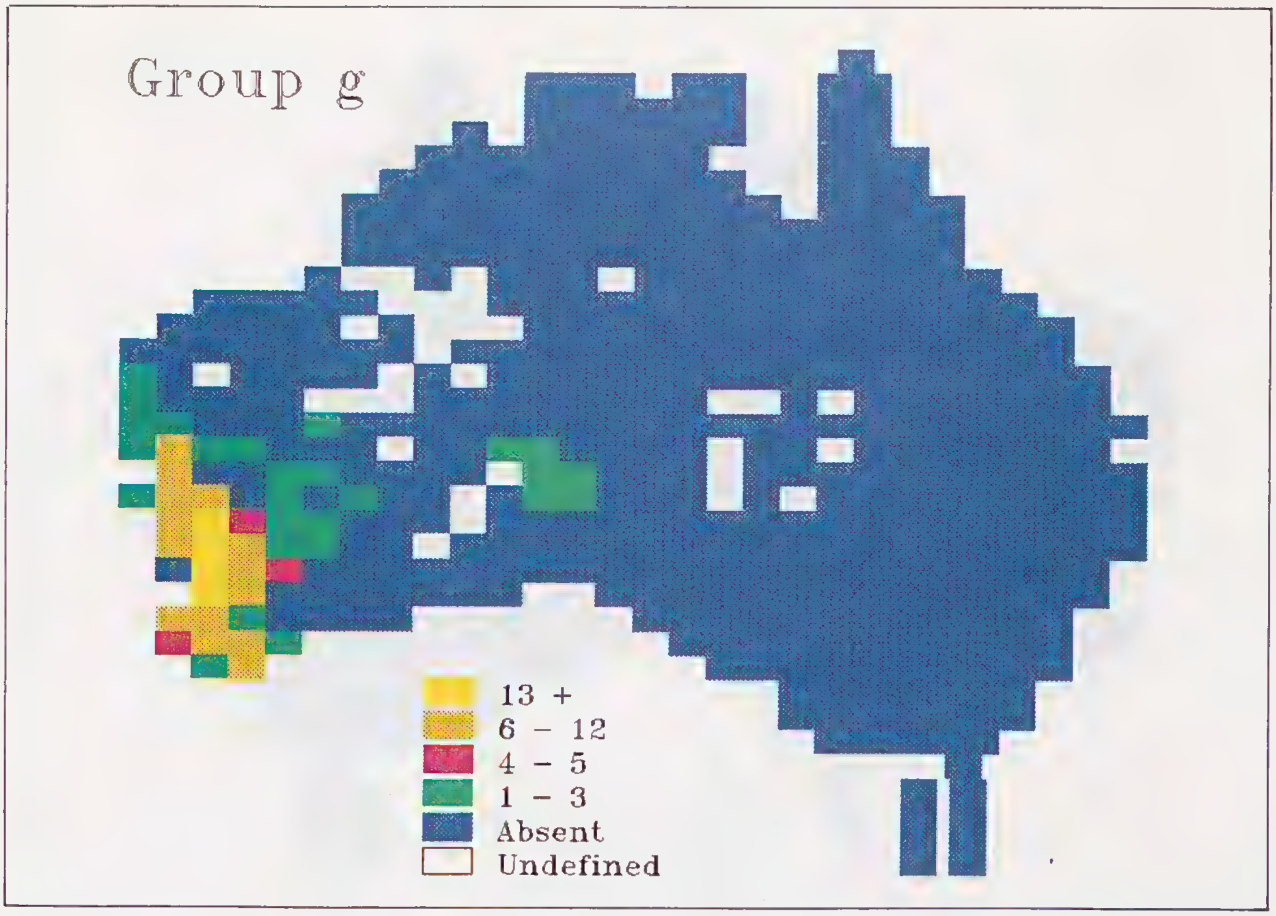

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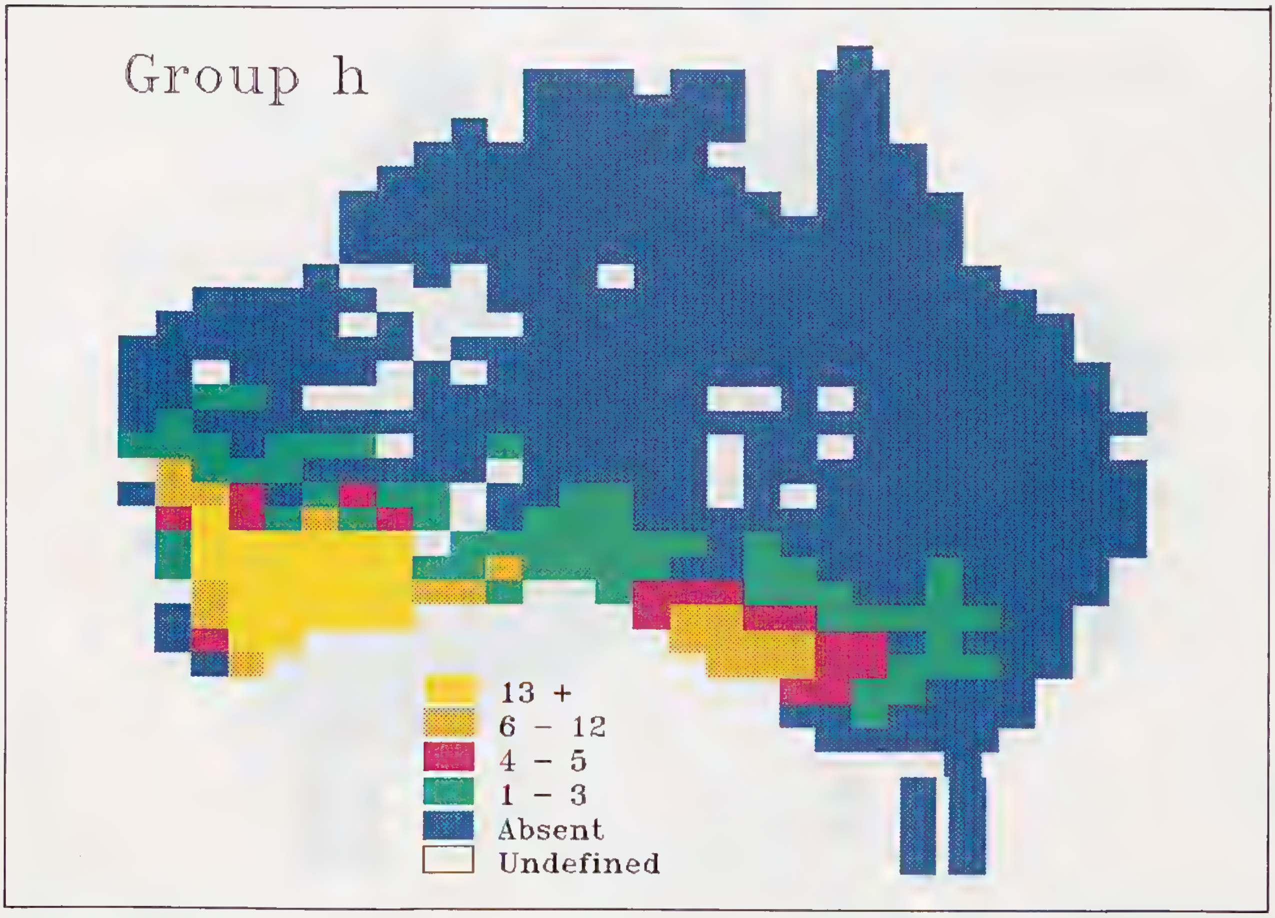

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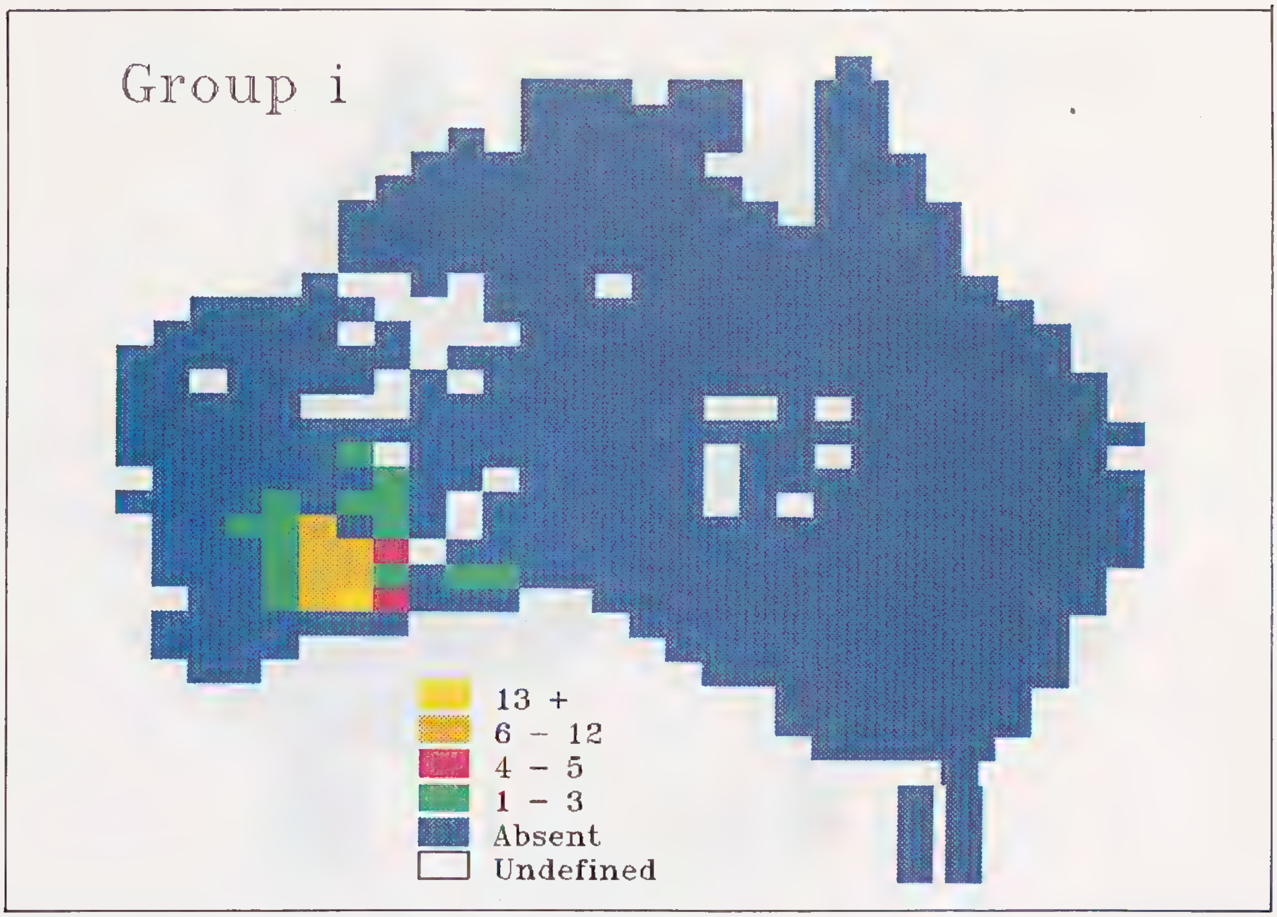

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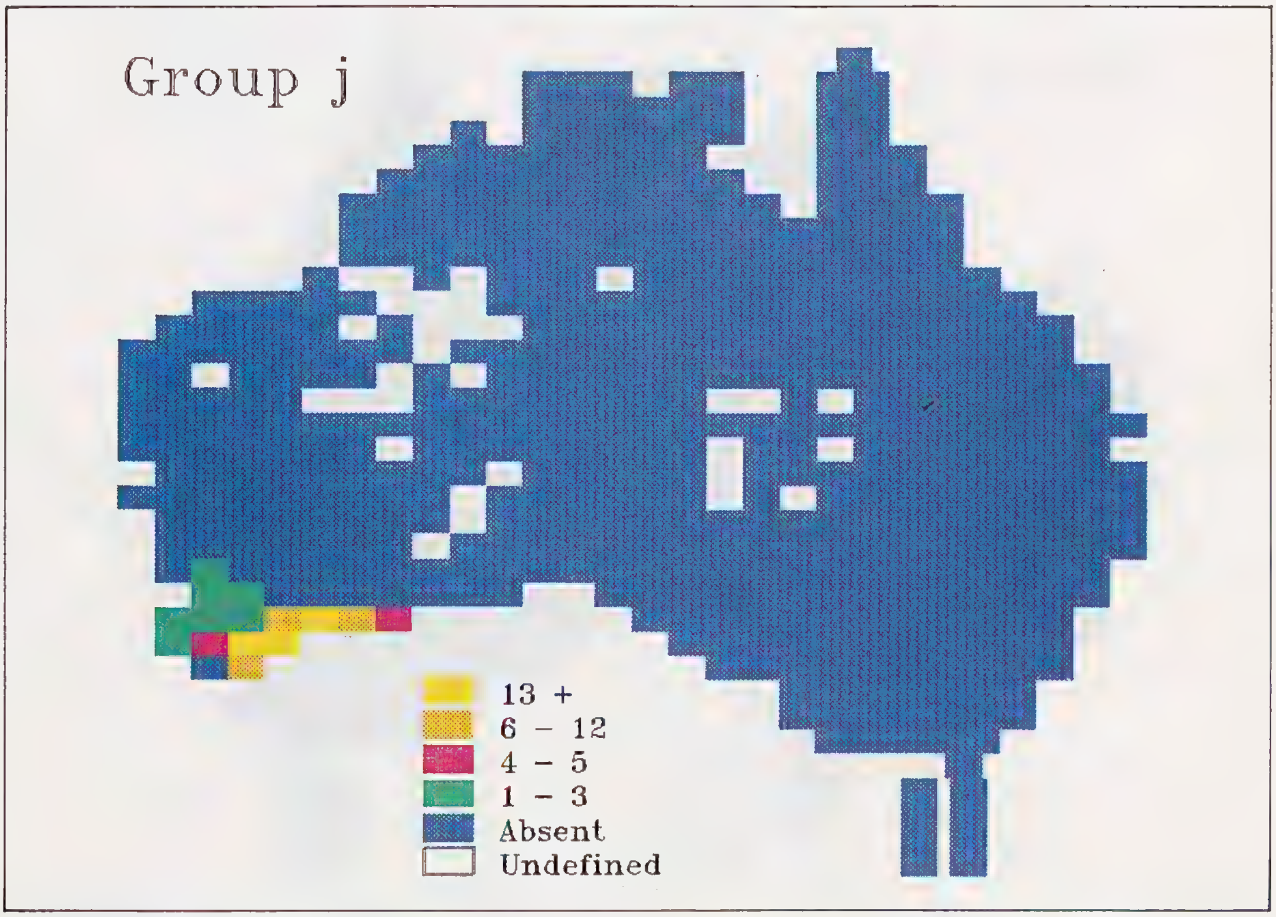

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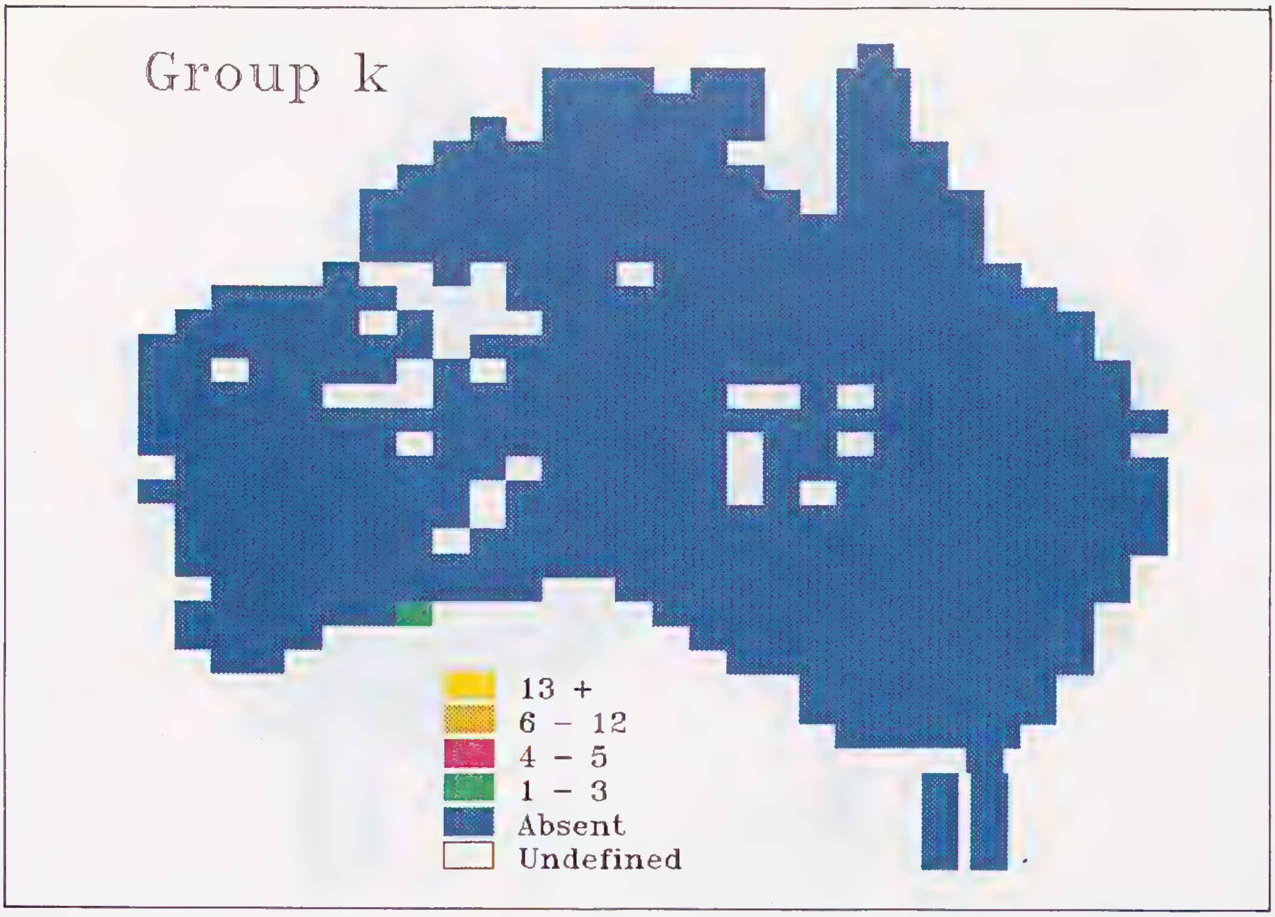

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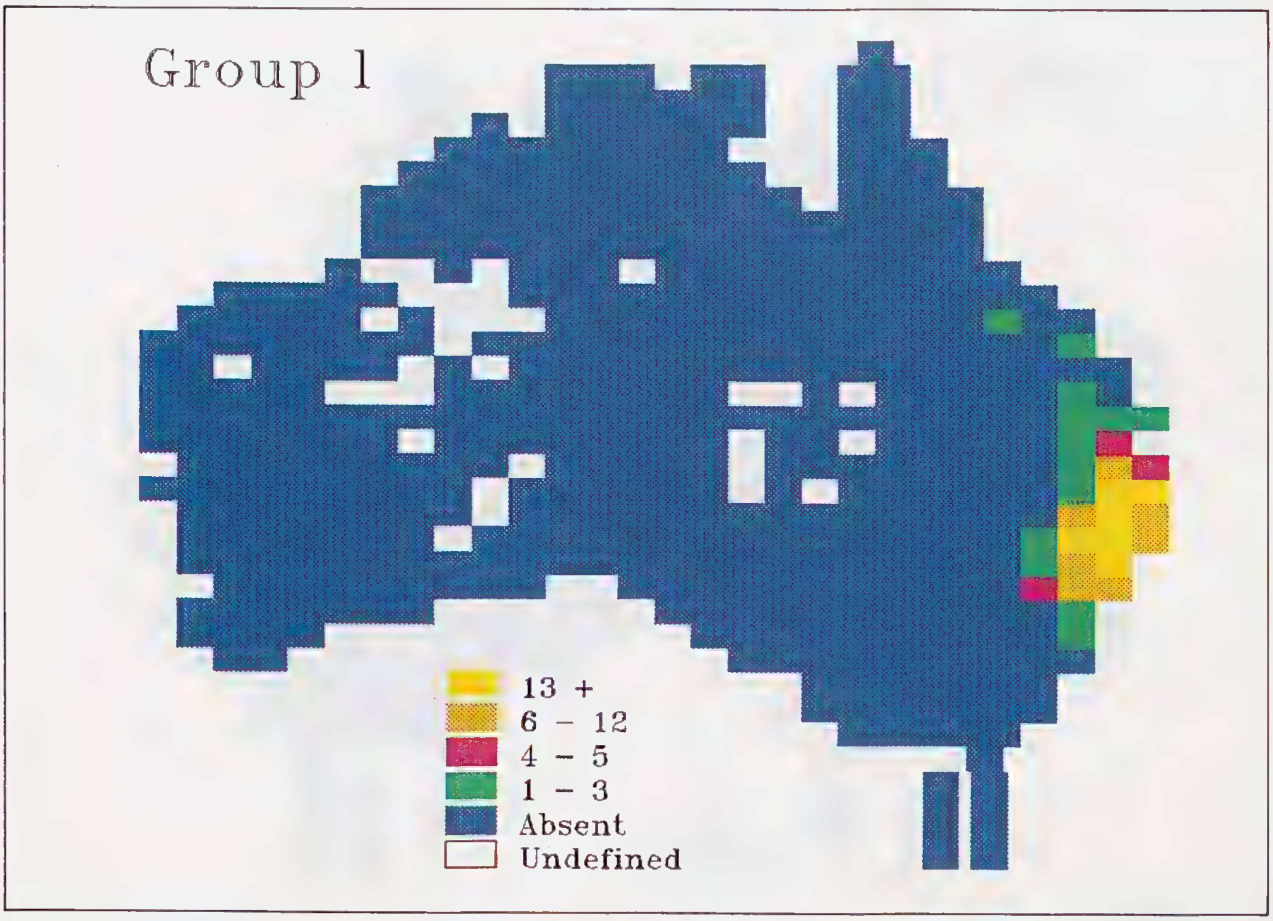

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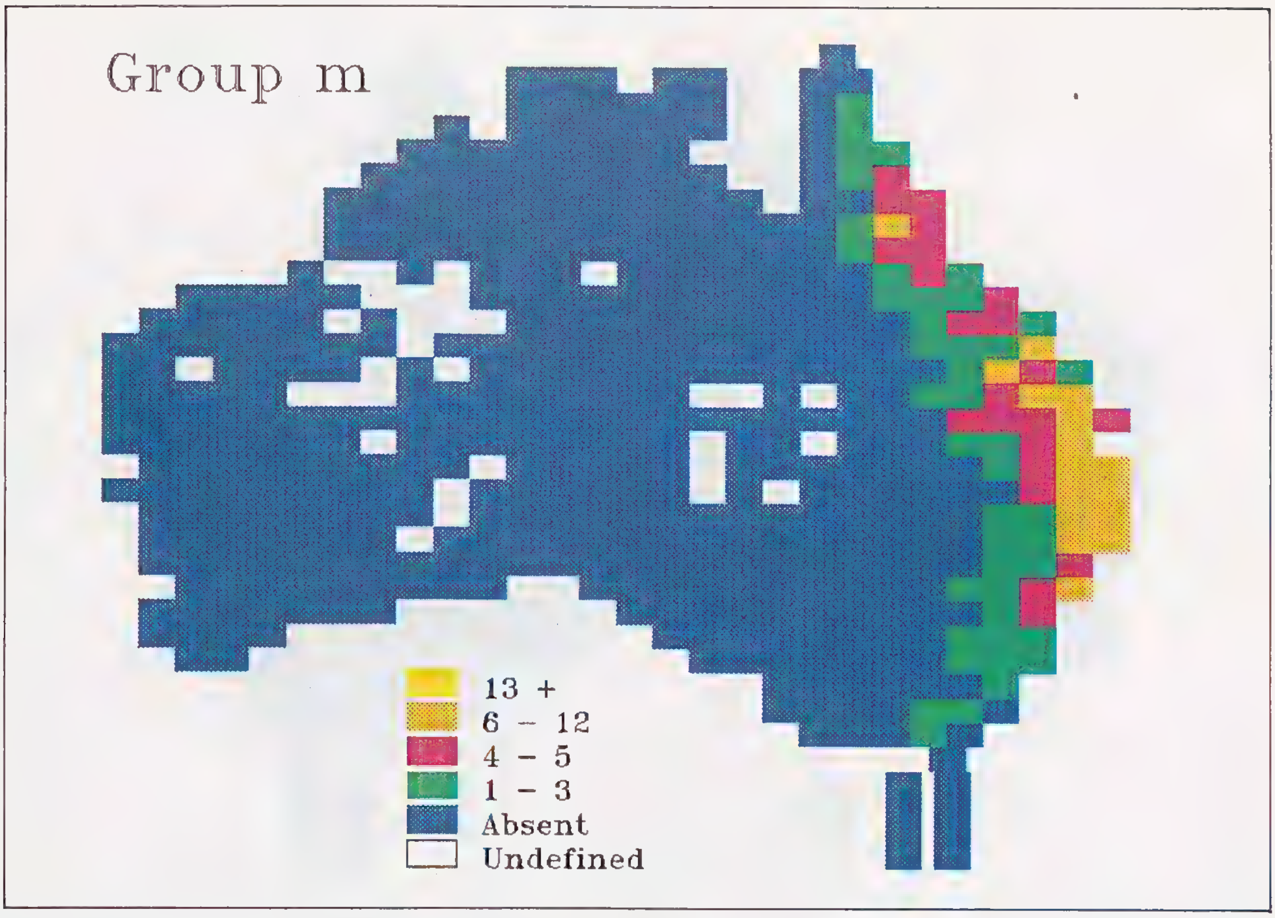

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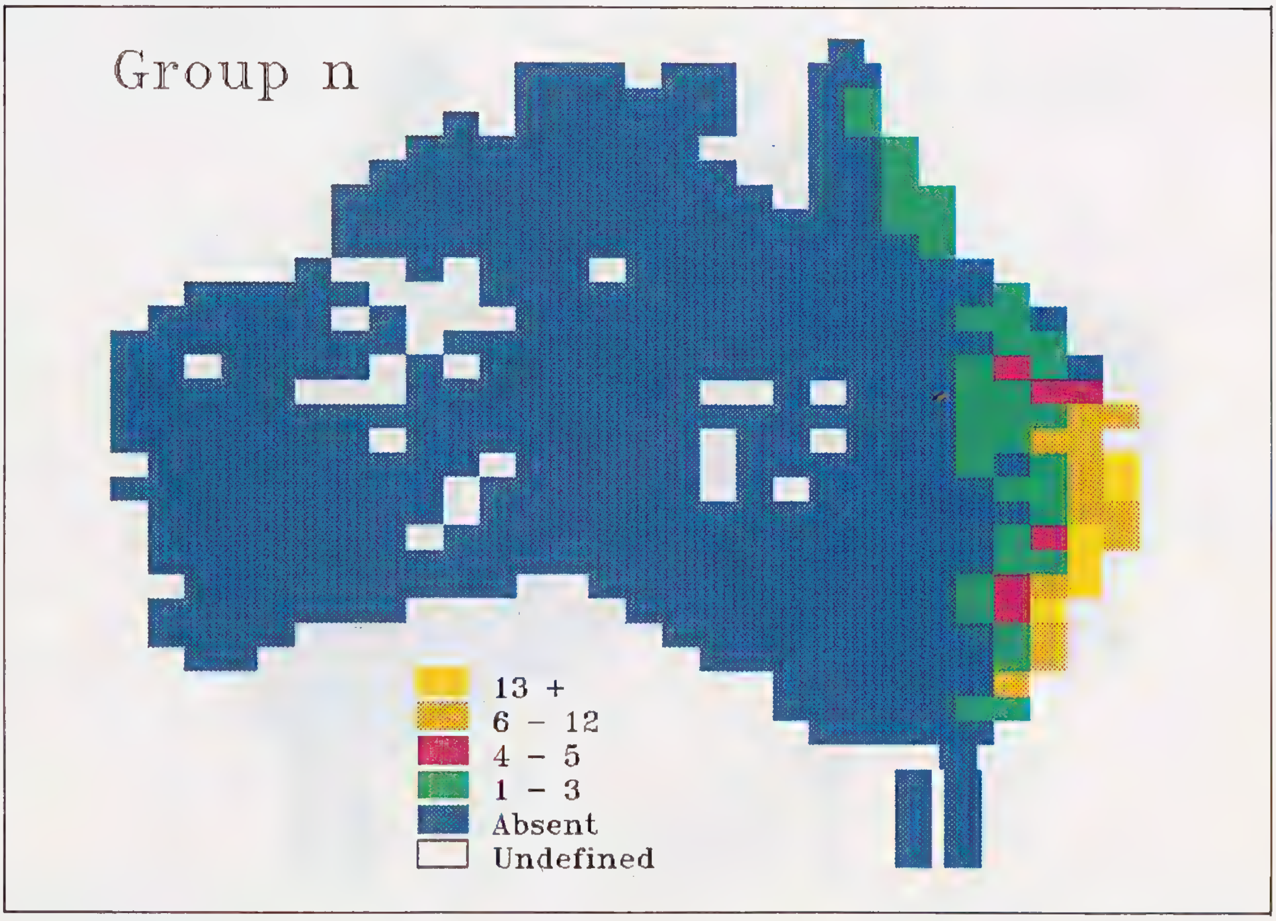

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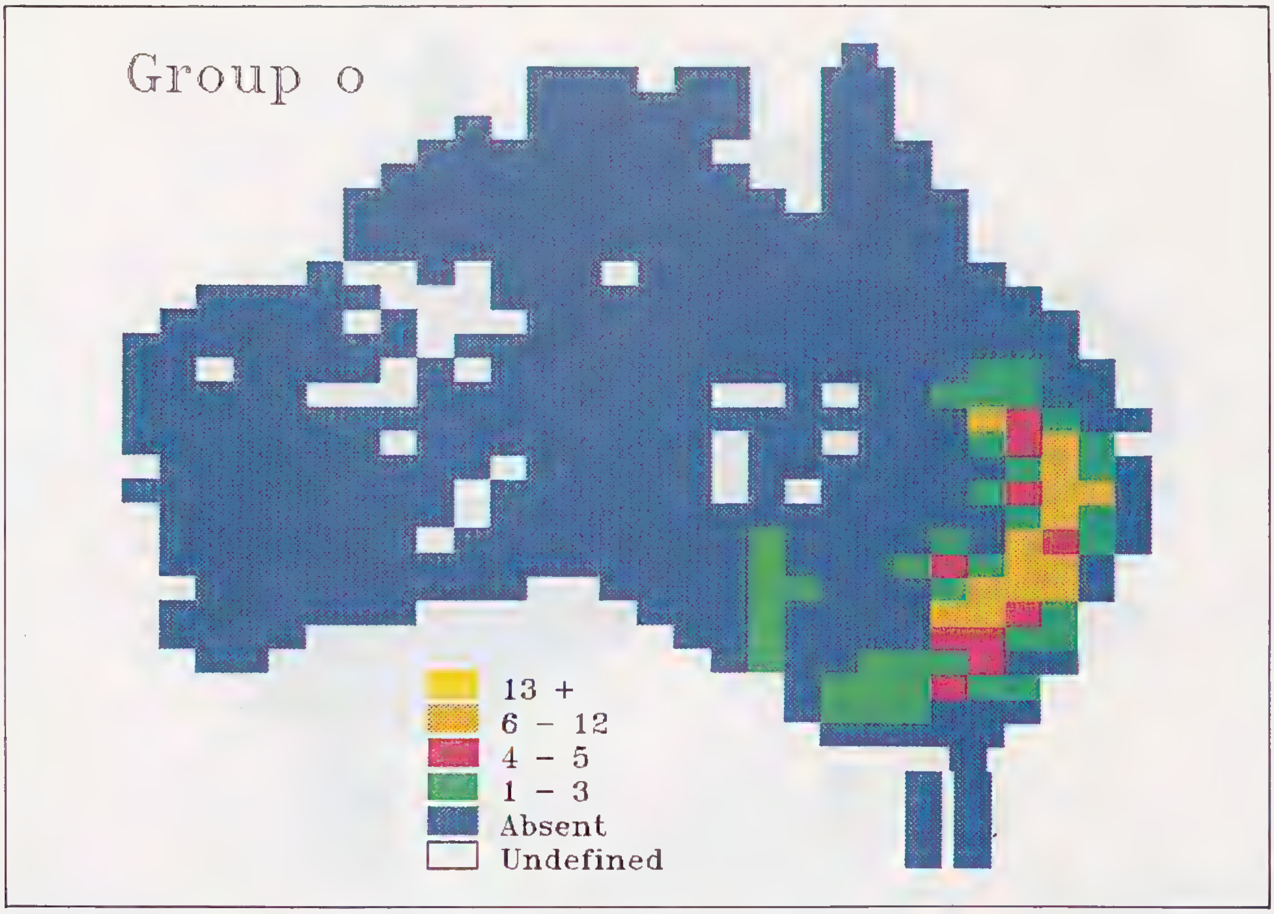

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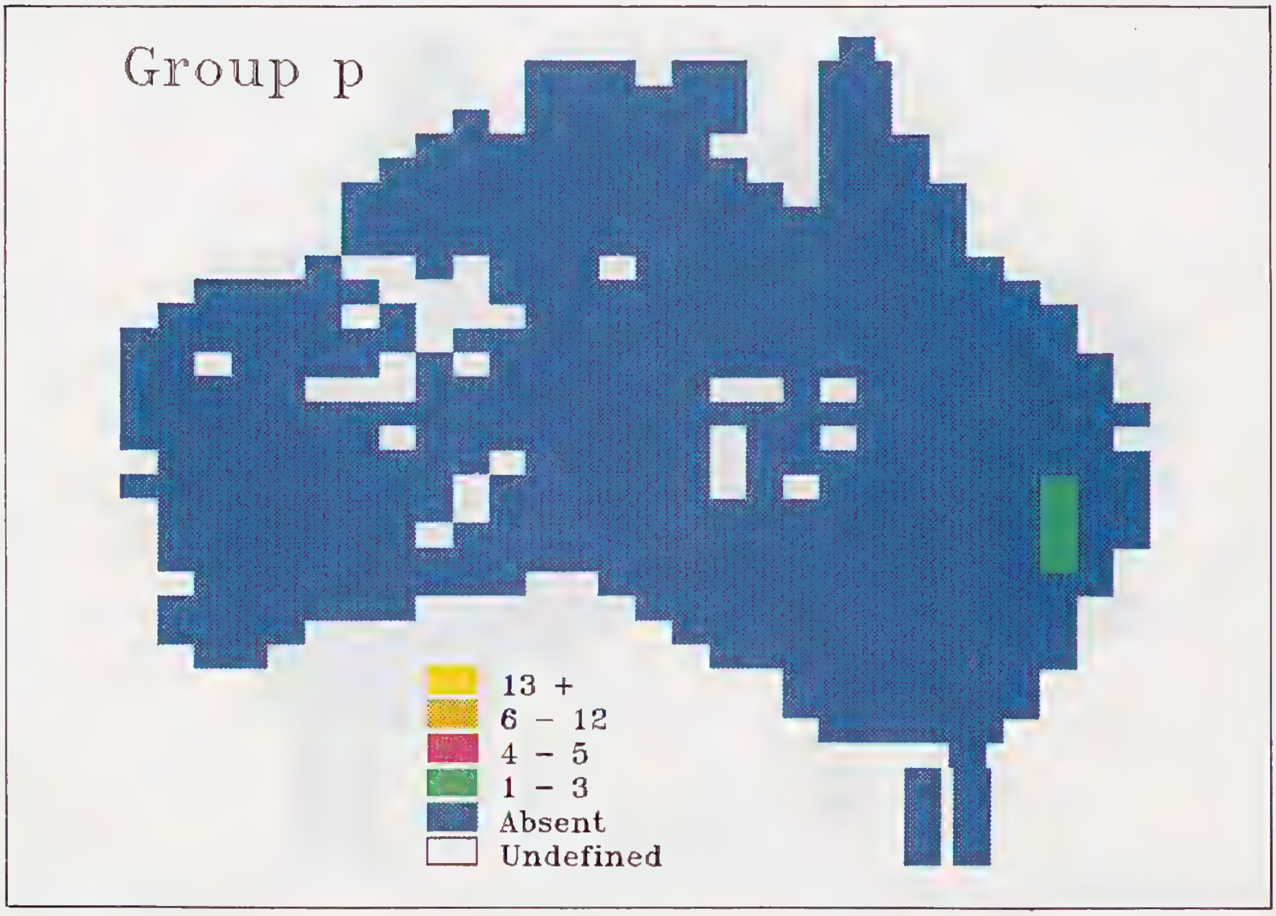

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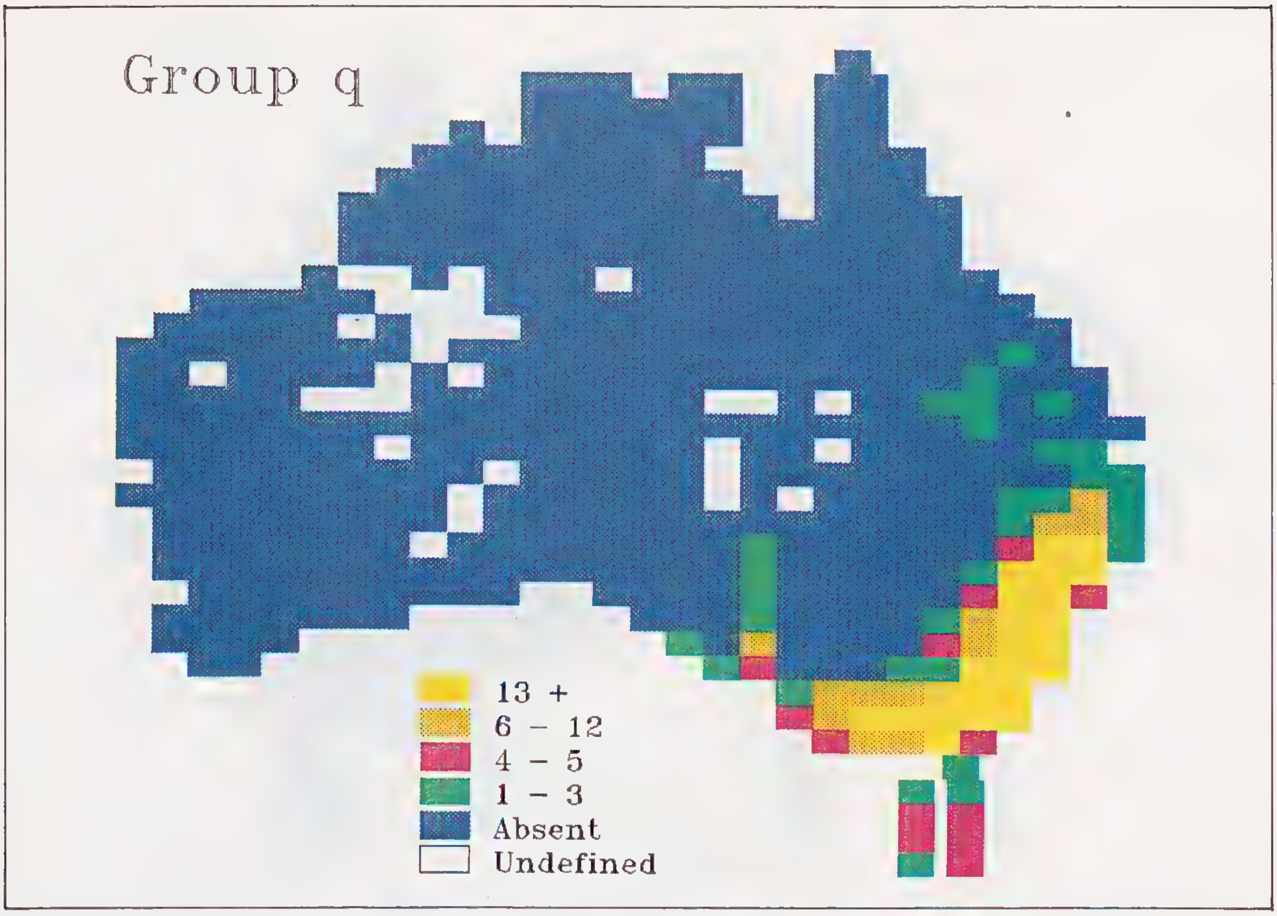

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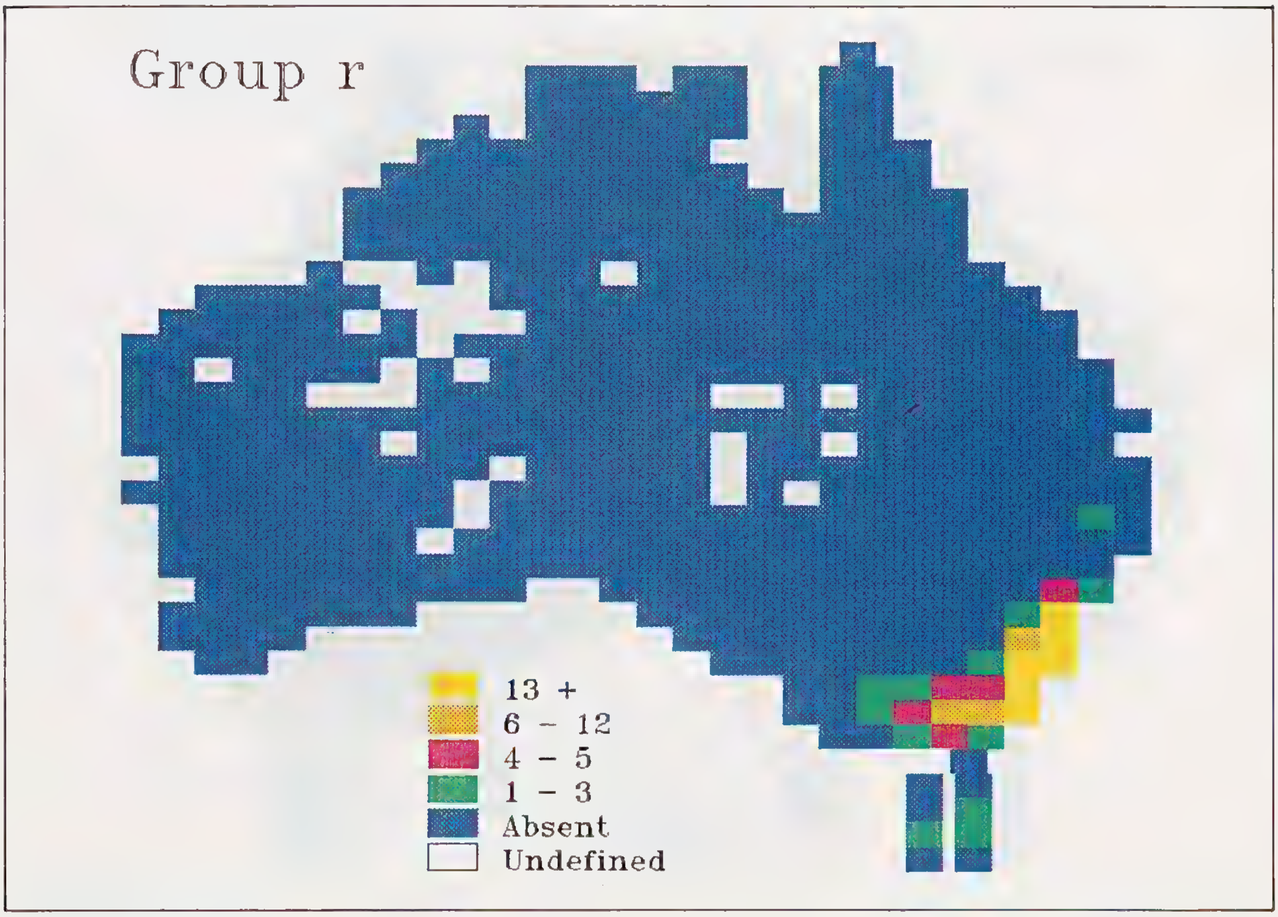

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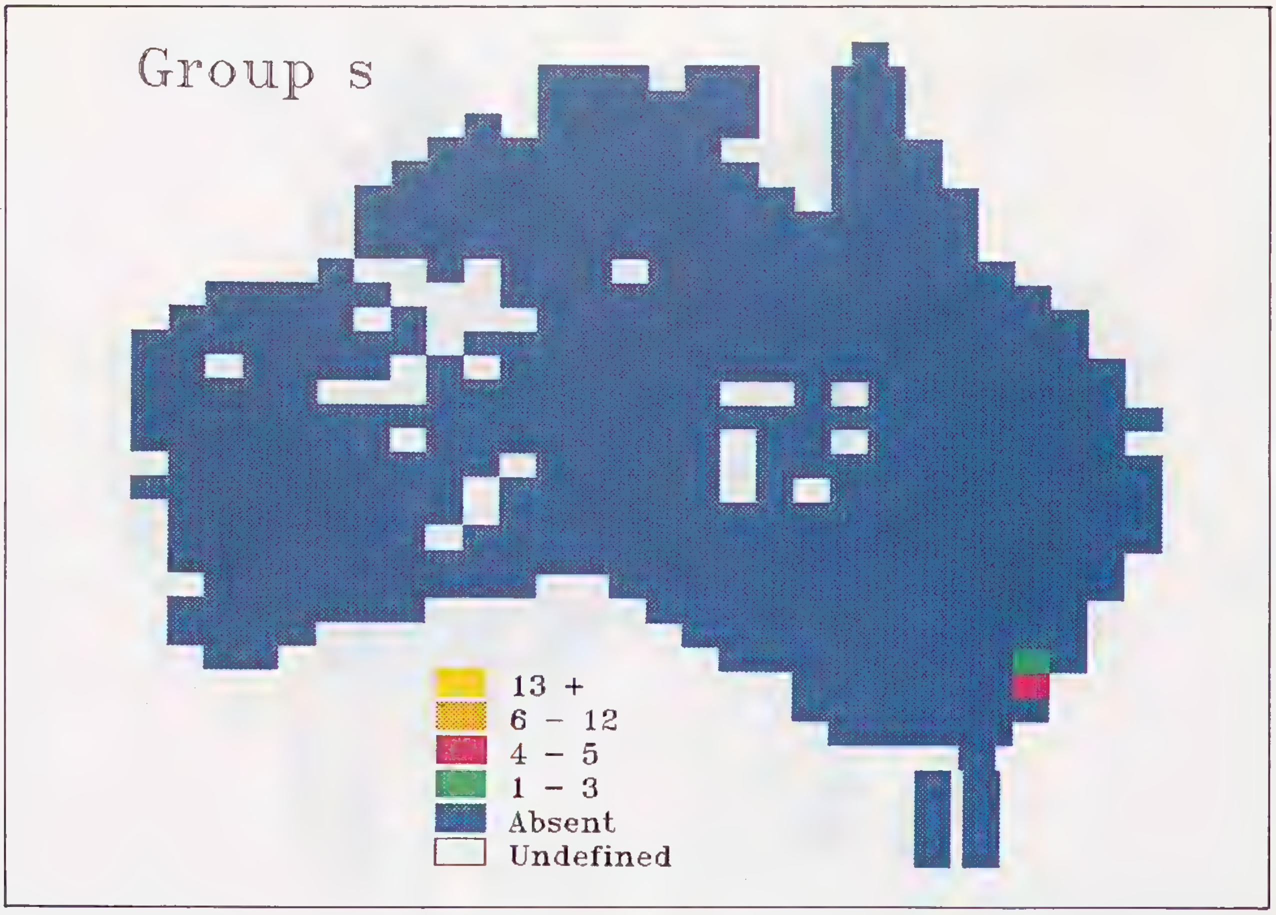

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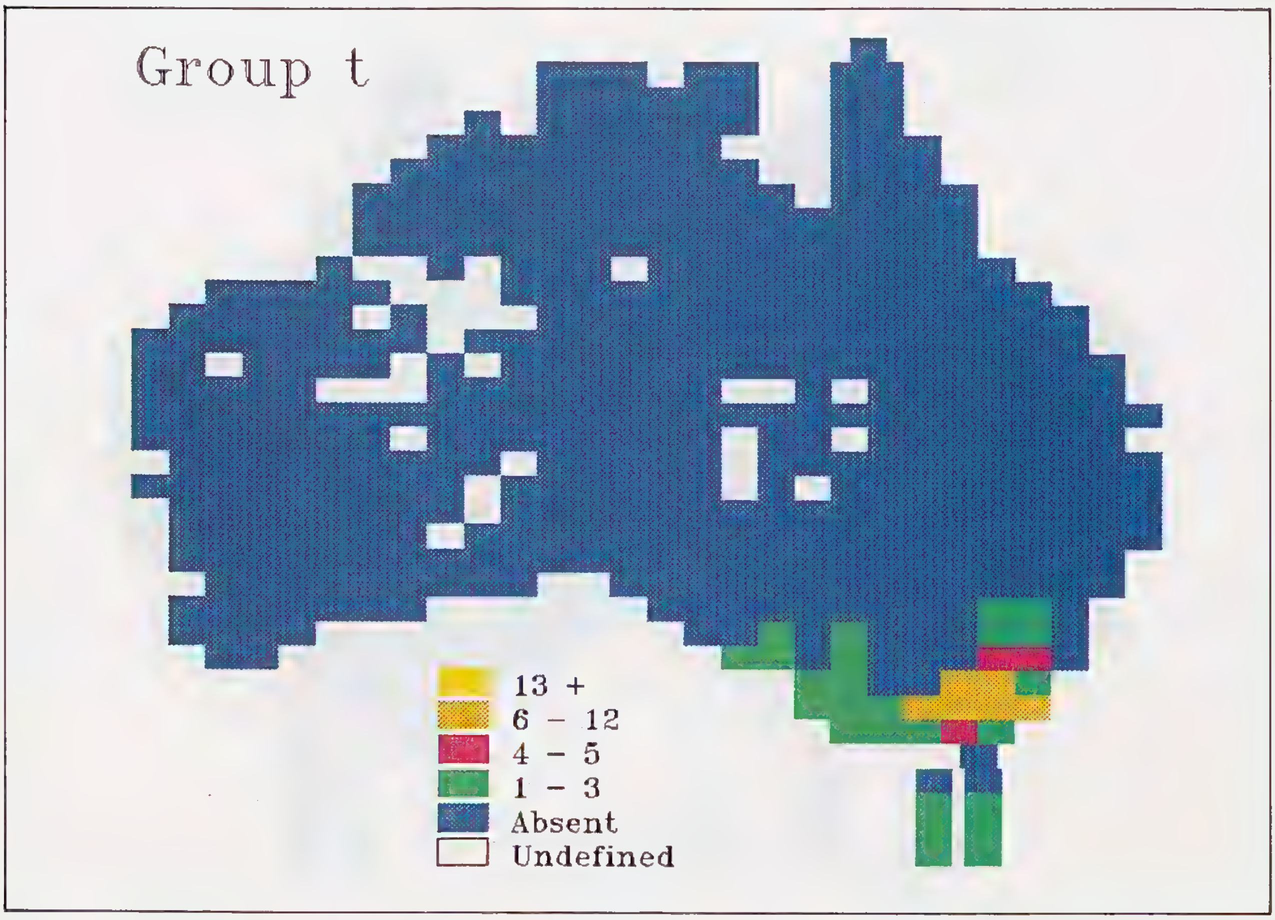

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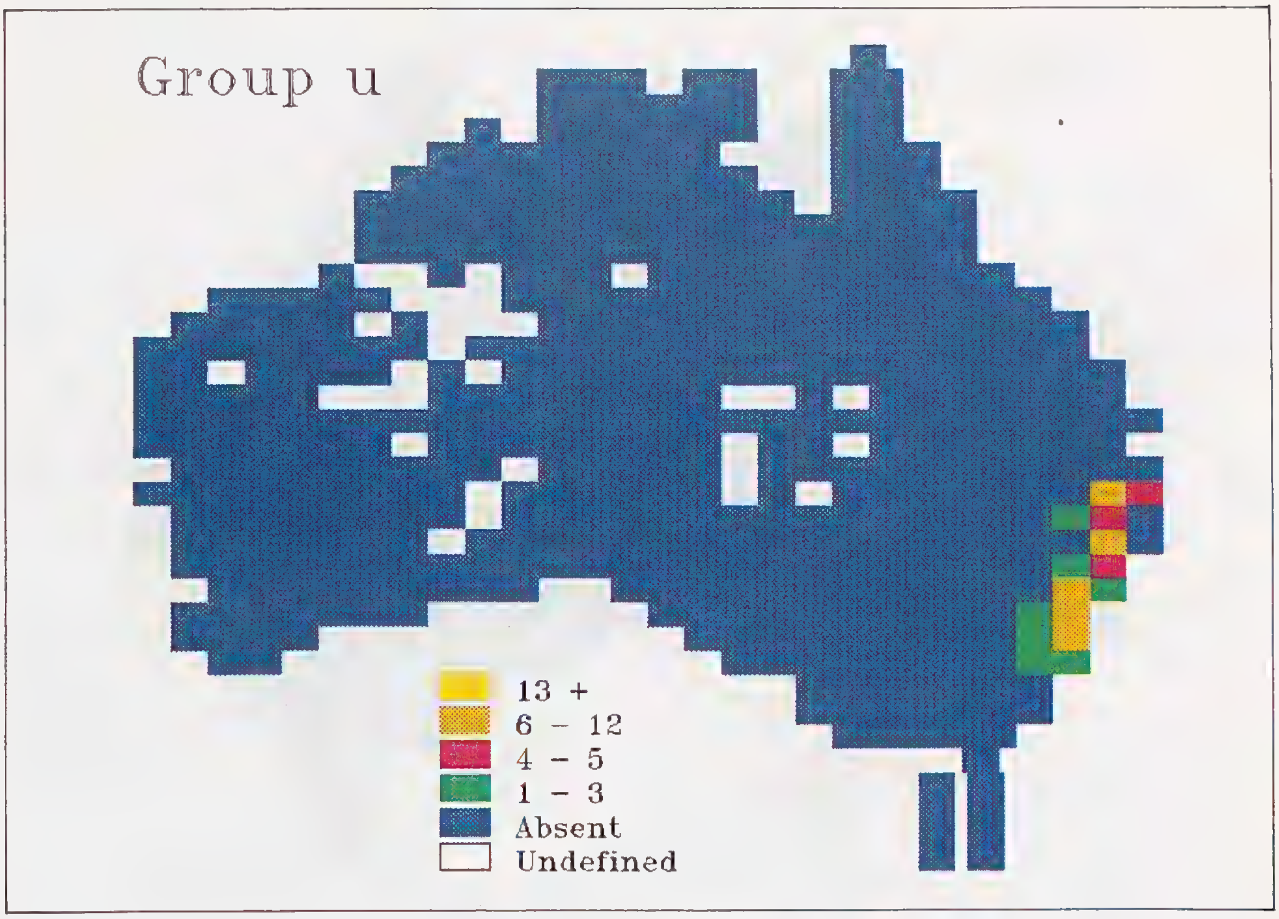

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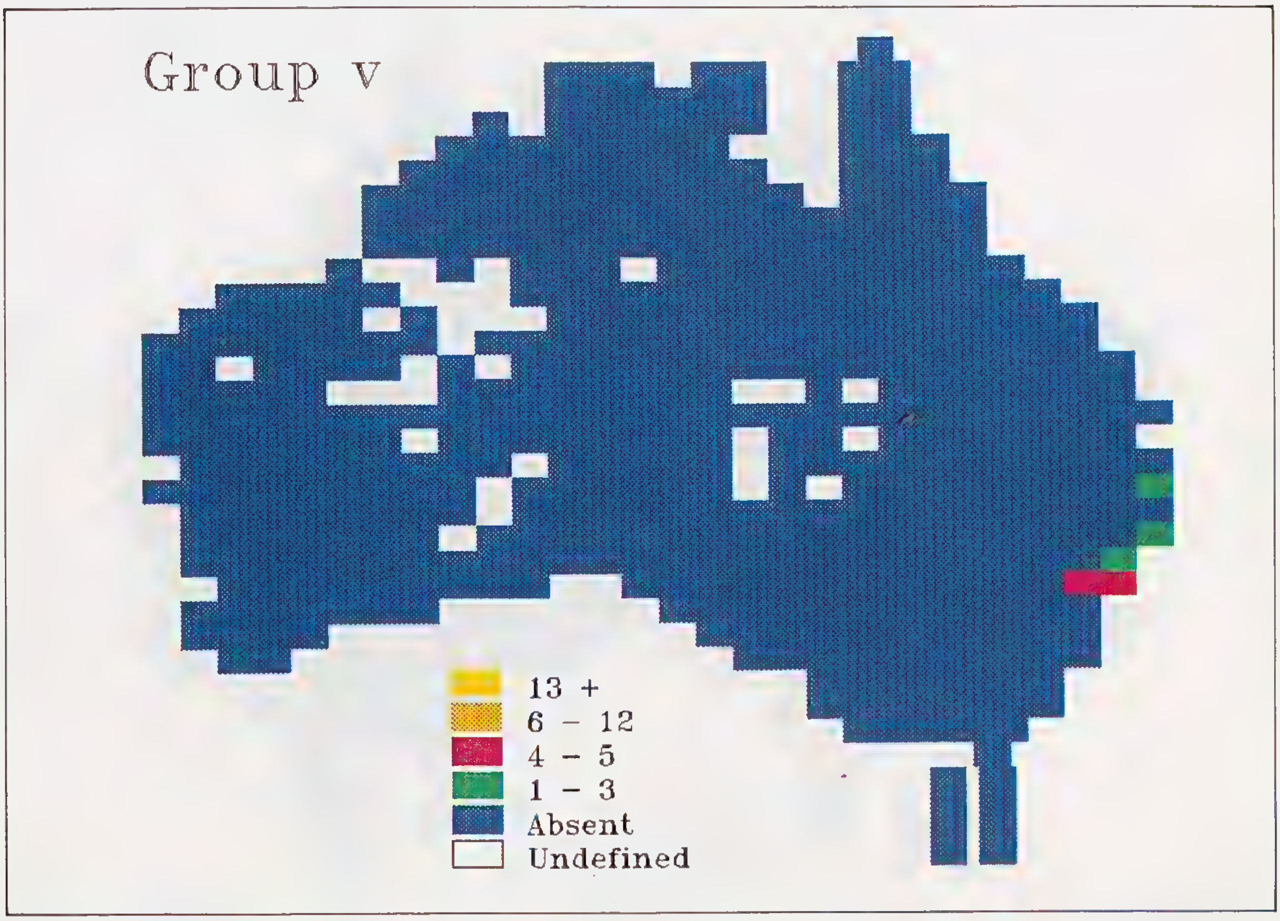

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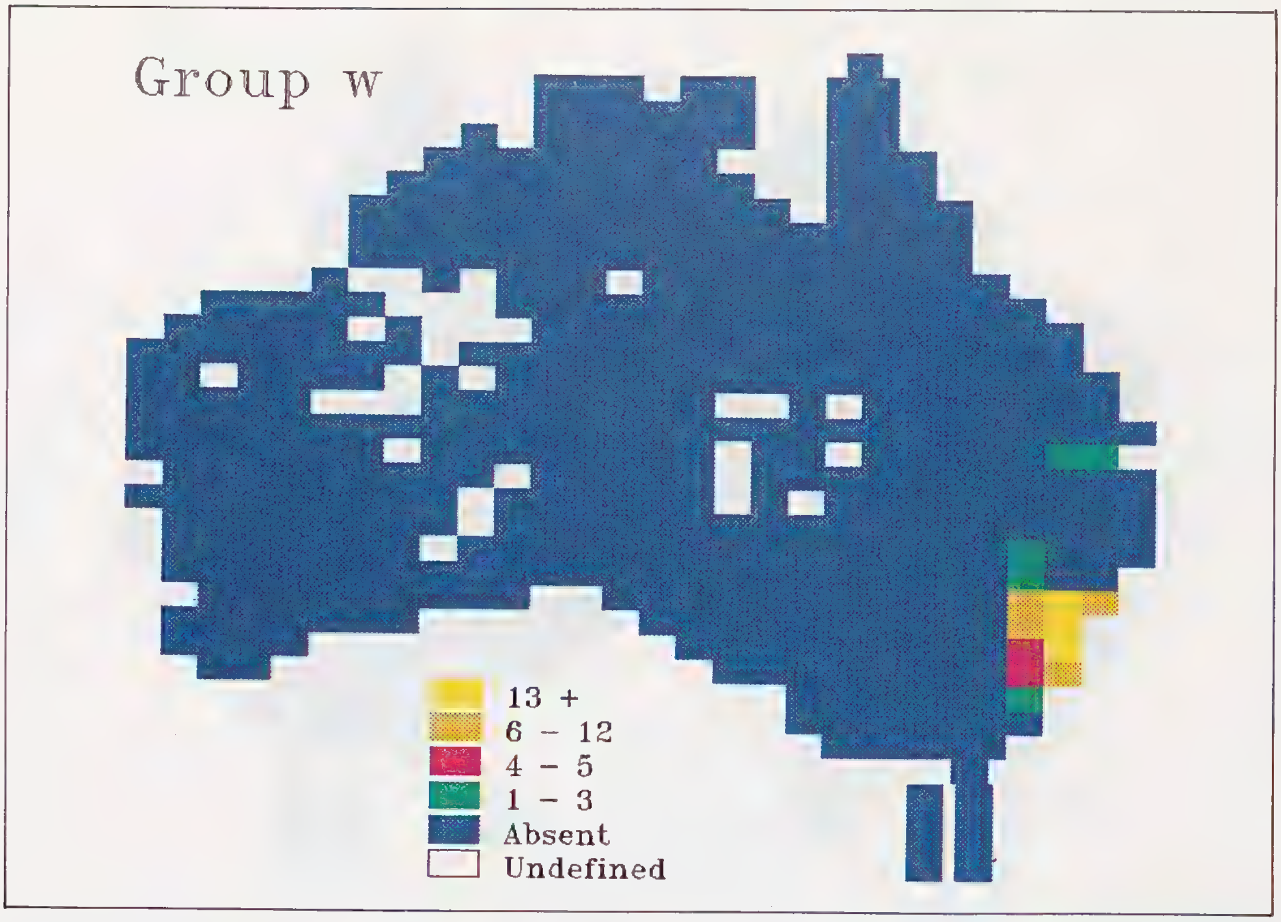

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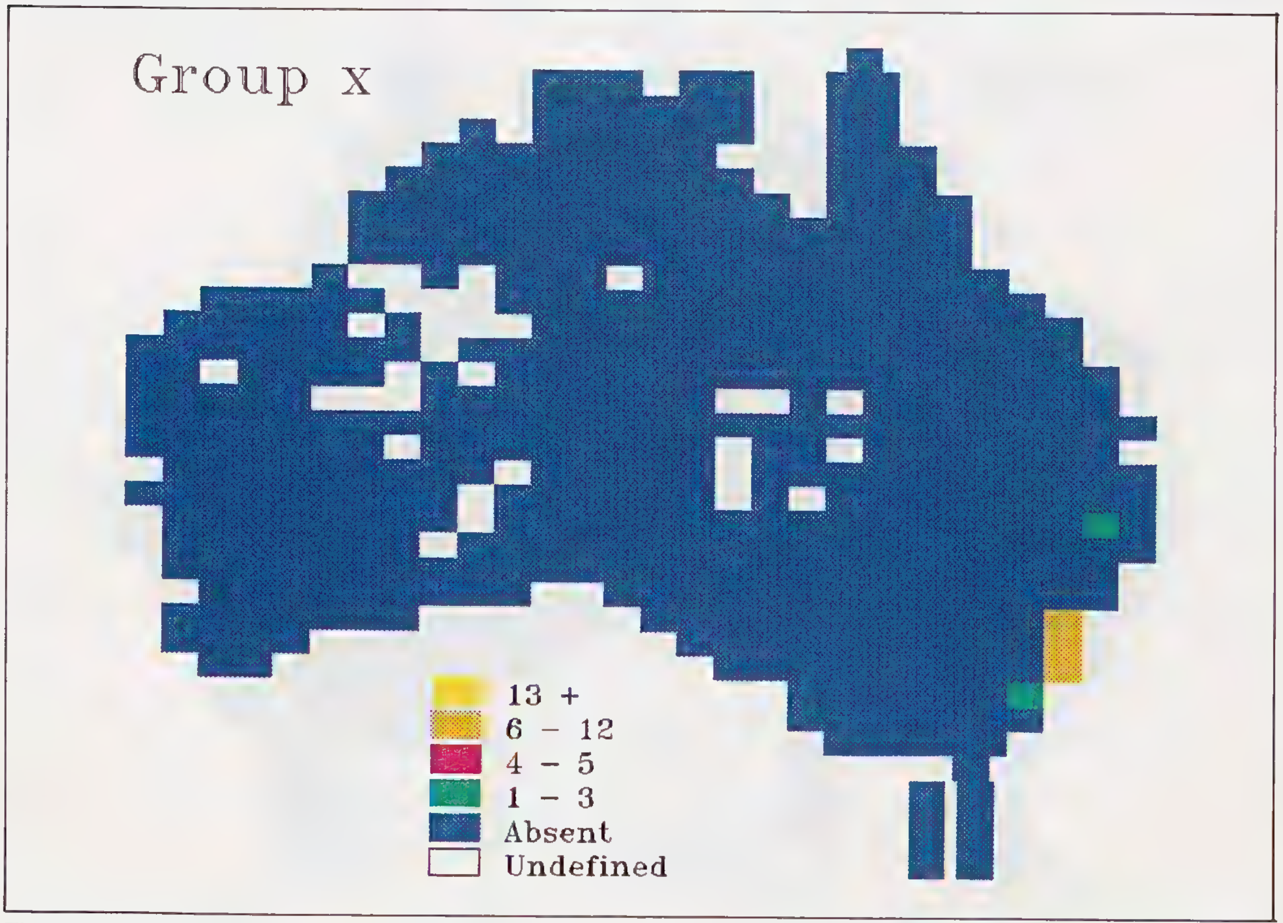

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Boxes with greater than 20% presence were identified by the respective codes for zones and taxon groups from Tables 2 and 3. They were: Dd (23.3%), Dm (45.6%), Kh (34.0%), Lg (25.3%), Om (34.3%), On (41.2%), Oo (28.1%), Oq (53.5%), Or (21.8%), Ou (25.0%) and Pc (27.8%). All the zones involved were from eastern or south-western Australia.

Overlaps in distributions of zones and taxon groups were expressed as the congruence index — which can vary from zero (no overlap) to 100% (exact congruence). Values are given in Table 5. The most congruent groups were Pc (Tas.–Vic.) with 80%. Other high values were Ib (southern Australia) with 69%; Dm (eastern Australia) with 68%; Ou (south-eastern Australia) with 65%; and Or with 63%.

Eighty per cent of the 17 major taxon groups (Table 5) have their highest congruence with less than half the 11 major zones (D, K, L, O, P). The major zones had their highest congruences with the widespread taxon group *a*, usually, but values in some of these cases were less than 10% (B, F, G).

(d) *Taxon densities particularly at subgeneric level*

Taxon density for the genus has already been presented by Chippendale (1981) and need not be further described here. Density at subgeneric level has not previously been mapped.

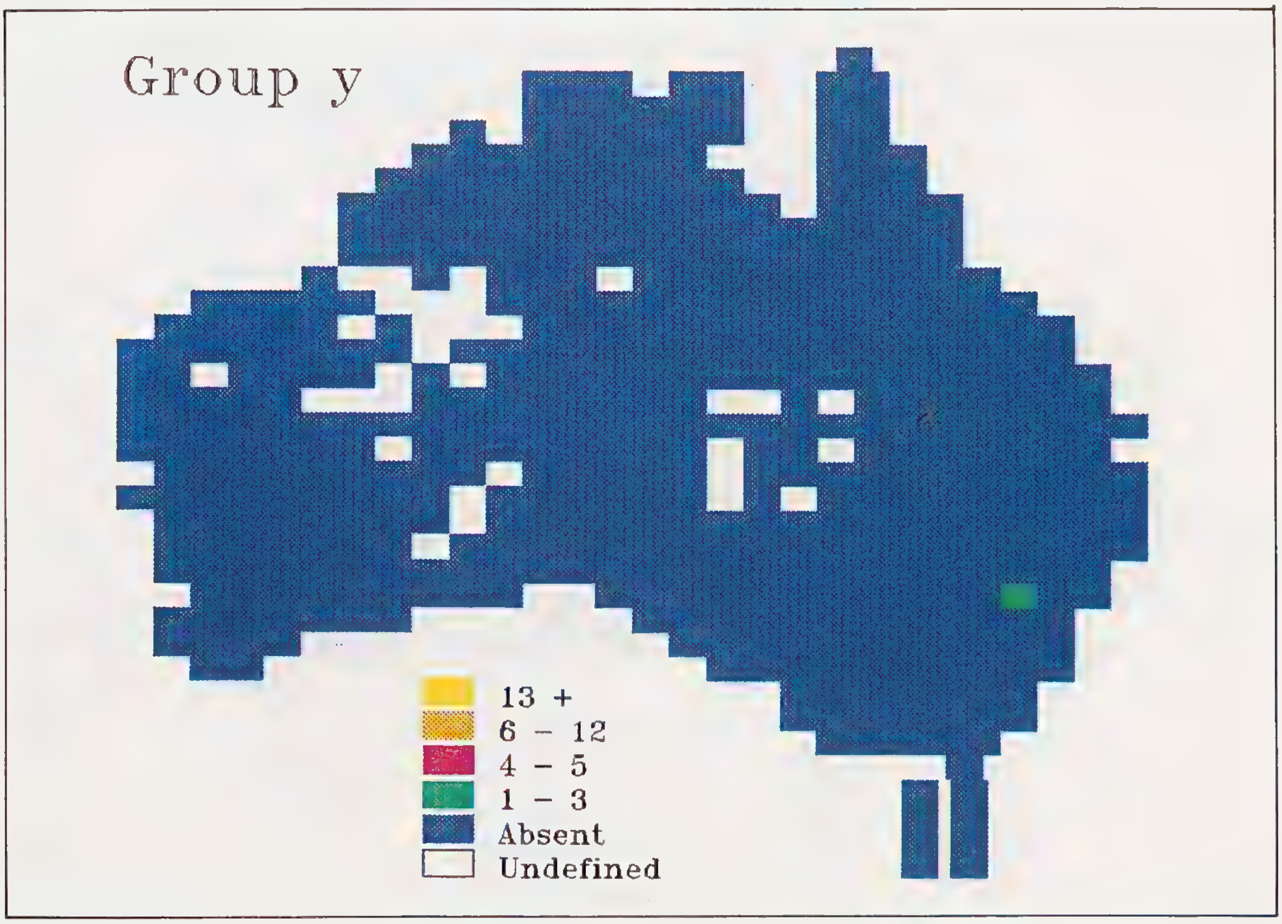
Blakella had 9 taxa most of which were found north of 26°S latitude (Fig. 5*a*). North of 19°S, the average density was >2; south of 19°S, <2. Two areas of concentration were evident: the Katherine–Kimberley area in the north-west and the southern edge of Cape York Peninsula in the north-east. The former area had taxon densities up to 6 taxa per MSD, the latter 5. *Blakella* showed no disjunction in distribution greater than 1 MSD.

Corymbia, with 38 taxa, was found to be mostly concentrated in an arc from Brisbane, Qld, north and west to the Katherine–Kimberley area of north-western Australia (Fig. 5*b*). The distribution as a whole could be described as north of 28°S, but with an extension into N.S.W. (especially the coast), and with an outlier in south-western Australia. Nodes with 9–12 taxa were found in eastern Qld and in the Katherine–Kimberley area.

Eudesmia spp. were found mainly to the north and west of a line from Malcolm, W.A., to Cairns, Qld, but also had a narrow distributional tongue extending south-eastwards from Gilberton, Qld, to Coffs Harbour, N.S.W. (Fig. 5*c*). *Eudesmia* were absent from south-eastern Australia. With only 16 taxa, concentrations of taxa were generally low although two nodes of relatively high density (up to 5 taxa per MSD) occurred, one just north of Perth, W.A. and another in the Kimberley. There was no disjunction in the distribution > 1 MSD in area, but extensive strings of MSD without *Eudesmia* separated some occurrences in W.A.

Monocalyptus (including *Gaubaea* and *Idiogenes*) had a mainly southern distribution for its 115 taxa. Its distribution was coastal and subcoastal and followed the southern and eastern shores of the mainland and included the whole of Tasmania (Fig. 5*d*). Major concentrations of up to 45 taxa per MSD (Sydney) occurred along the coast of N.S.W. A weak secondary node was apparent on the southern coast of W.A., but the peak density was only 11 taxa per MSD. A disjunction of 2 MSD occurred in the Nullarbor area.

Symphyomyrtus dominated *Eucalyptus* in having 366 taxa. Its distribution was Australia wide (Fig. 5*e*), but nodes in taxon density were apparent on the coast of N.S.W. (up to 56 taxa per MSD in Singleton, but 57 at Warwick, Qld), and along the southern coast of W.A. (up to 52 taxa per MSD in Ravensthorpe and Norseman). Minor nodes of relatively high taxon density were present in the Katherine–Kimberley area and around Alice Springs while an individual MSD with high



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taxon richness (23) compared with surrounding areas was Atherton, Qld. Some of these details are obscured in Fig. 5*e*.

Nodes within subgenera may be described in relation to the zones of Fig. 2. Concentrations of taxa for *Blakella*, *Corymbia* and *Eudesmia* were found in the northern and north-eastern zones (C and D): *Eudesmia* had an extra node in the north-west corner of zone K in south-western Australia. Nodes for *Monocalyptus* and *Symphyomyrtus* were in the south-eastern zone, O, and the south-western zones K and L.

(e) *Sampling*

'Sampling' is used here in a very broad sense. It includes the time course of recognition of taxa (assumed to be natural entities in the field), the extent of collections (specimens per taxon per MSD) and the use of the quadrat size of 1 MSD.

The trend in numbers of taxa with time was upward and continued to the present (Fig. 6). The years in which taxa were described, rather than those in which type specimens were collected, were used because more records were available. The trend was likely to be the same for the latter data because there was no systematic time trend for the period between collection and description.

Because of the known errors in some of the detailed locational data in EUCALIST, the calculated values for specimens per taxon per MSD may best be viewed as an index. Regional trends were more significant than individual figures. Peaks in the index were apparent around the capital cities (up to *ca.* 70 near Hobart), near Alice Springs, and in the Atherton district of Qld. Values greater than 10 were general throughout south-eastern Australia — in a crescent from the Rockhampton area through to the Ceduna area of S.A. Also, such values were common in south-western Australia.

Apart from the Alice Springs area, the large central arid zone (A) had low collection indexes while the south-eastern zone had generally high indexes. Indeed, there was a statistically-significant correlation between the logarithm of the number of taxa (and also endemics) per major zone and the logarithm of the average collection index ($r = 0.762$, $P < 0.01$, $n = 11$). Before transformation of the variables, the trend for more collections, more species, was not statistically significant.

(f) *Environmental correlations*

The meteorological data available to us showed intercorrelation between variables to be common. Data were rarely distributed normally, however, and linear methods were not necessarily appropriate. Highly significant linear correlations were found between RAINMIN and RAINDRYQ ($r = 0.993$, $n = 502$), RAINMAX and RAINWETQ ($r = 0.998$, $n = 502$), and RAINMEAN and RAINWETQ ($r = 0.928$, $n = 502$). TEMPWETQ was bimodally distributed around 20°C: sites above and below this value were 343 and 158 of the 502 available, respectively. The cooler sites had a general distribution south of lines drawn between (and including) the MSD of Ningaloo and Peak Hill, W.A.; Boorabin, W.A. and Alberga, S.A.; Woodroffe, S.A. and Deniliquin, N.S.W.; Nymagee, N.S.W., alone; Cootamundra, N.S.W., alone; and Gilgandra, N.S.W., alone. The MSD of Broken Hill, Menindee, Dorrigo and Hastings were also included.

In a similar way to the above, averages for each meteorological variable for each of the 11 major zones were often correlated. Average temperature was correlated at $P < 0.01$ with TEMPMIN, TEMPMAX and TEMPWETQ and, at $P < 0.05$ with TEMPDRYQ. Average rain was highly correlated ($P < 0.001$) with RAINMAX and RAINWETQ. RAINMAX was correlated at the same level with RAINWETQ. RAINMIN was similarly correlated with RAINDRYQ. Average values for each zone are given for TEMPMAX, TEMPWETQ, RAINMAX and RAINMIN

Table 5. Highest congruence indexes for zones and taxon groups.

Taxon group	*Zone*	*Index (%)*	*Zone*	*Taxon group*	*Index (%)*
a	A	53	A	a	53
b	I	69	B	a	4
c	P	80	C	a	27
d	D	60	D	m	68
g	K	48	F	a	4
h	I	59	G	a	7
i	K	61	I	b	69
j	L	61	K	i	61
l	O	60	L	j	61
m	D	68	O	u	65
n	D	56	P	c	80
o	O	40			
q	O	55			
r	O	63			
t	P	50			
u	O	65			
w	O	53			

Table 6. Average values for TEMPMIN, TEMPWETQ, RAINMIN and RAINMAX for 11 major zones.

Zone	*TEMPMAX*	*TEMPWETQ*	*RAINMIN*	*RAINMAX*
A	38.0	27.3	5	65
B	37.1	27.5	5	112
C	35.8	28.9	3	250
D	32.7	25.3	24	179
F	38.1	30.1	2	123
G	37.5	24.0	6	35
I	32.2	15.7	16	38
K	32.9	15.3	11	55
L	28.7	12.5	11	184
O	27.5	17.2	52	123
P	24.0	9.0	48	101

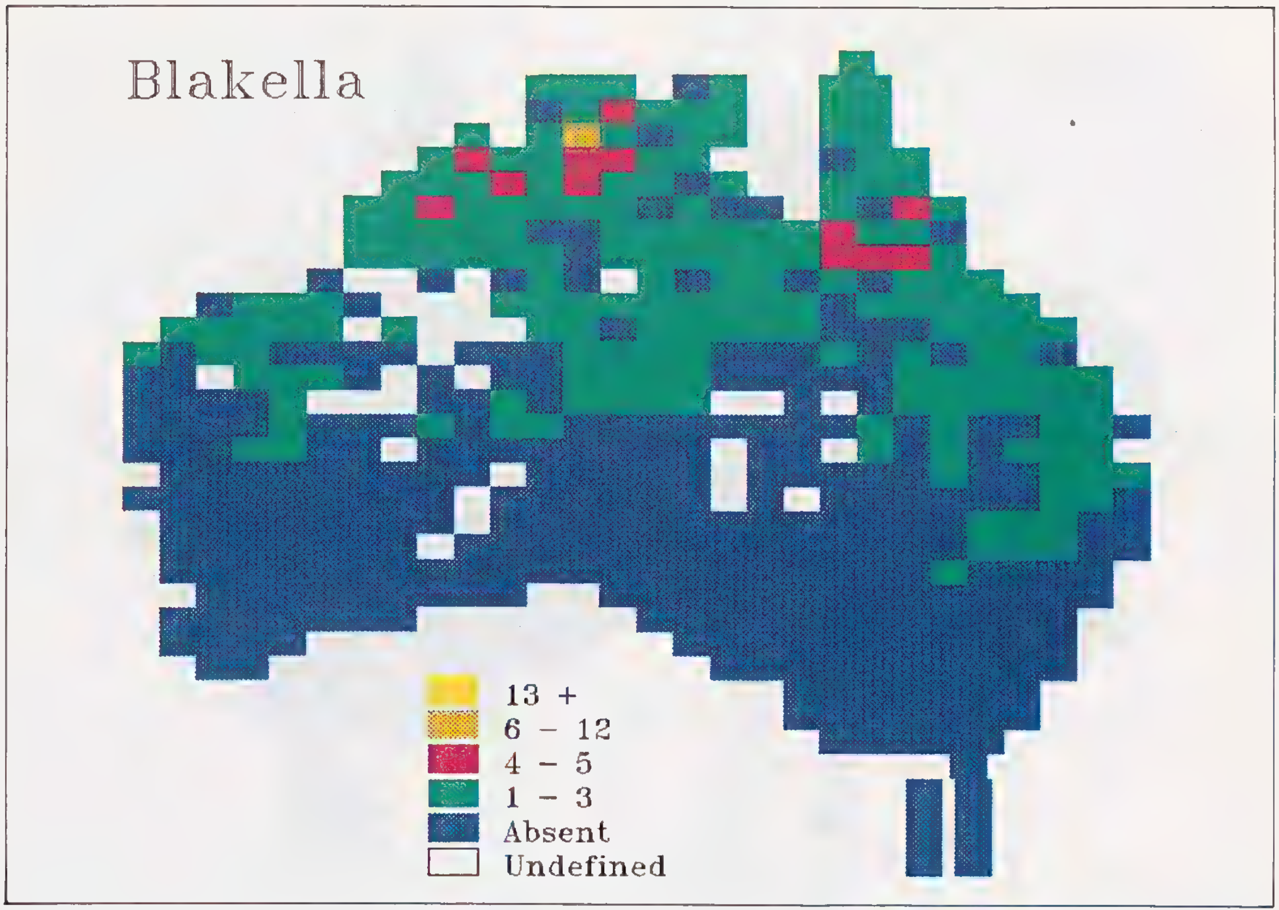


Figure 5. Maps of taxon density for the subgenera of *Eucalyptus*: (a) *Blakella*, (b) *Corymbia*, (c) *Eudesmia*, (d) *Monocalyptus*, (e) *Symphyomyrtus*.

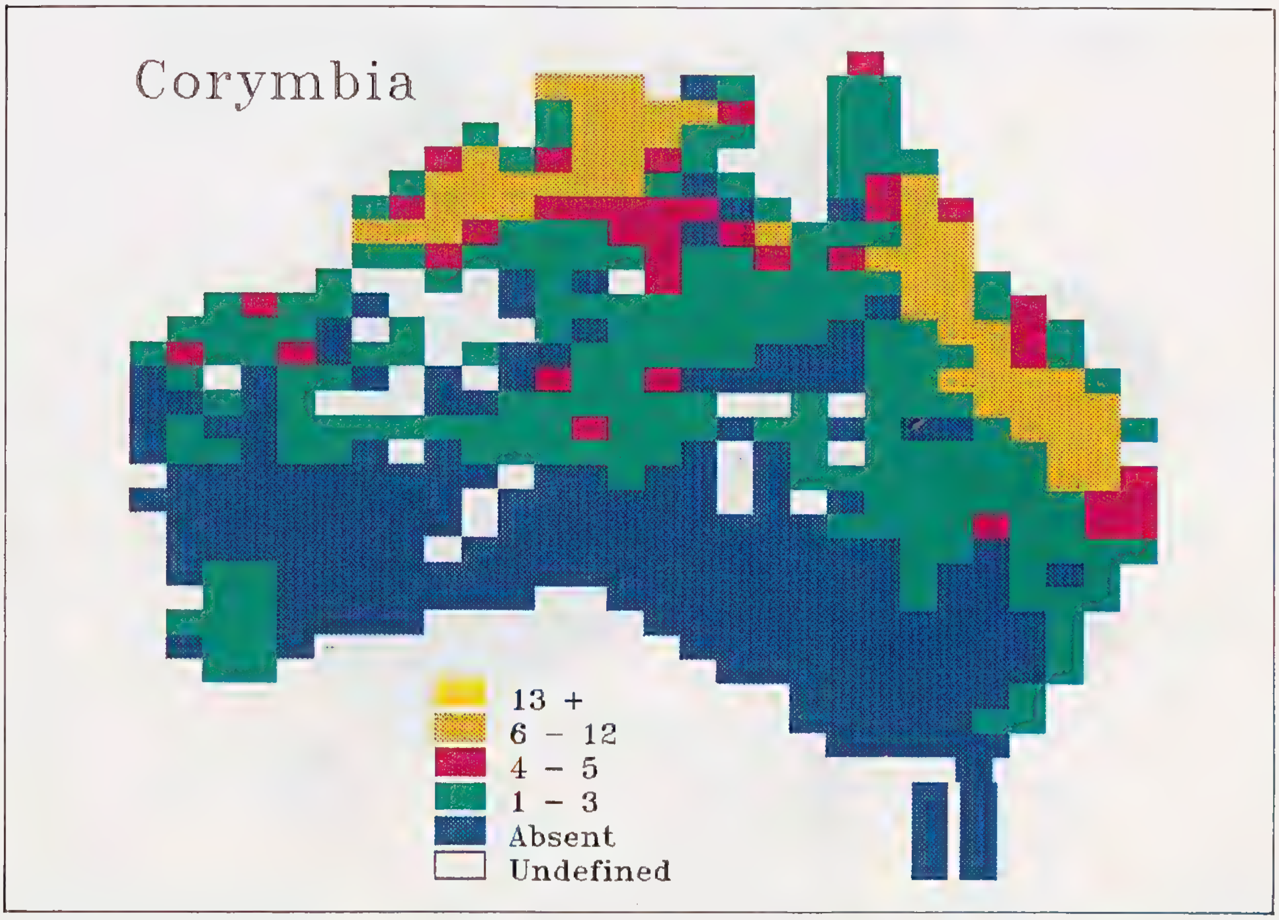
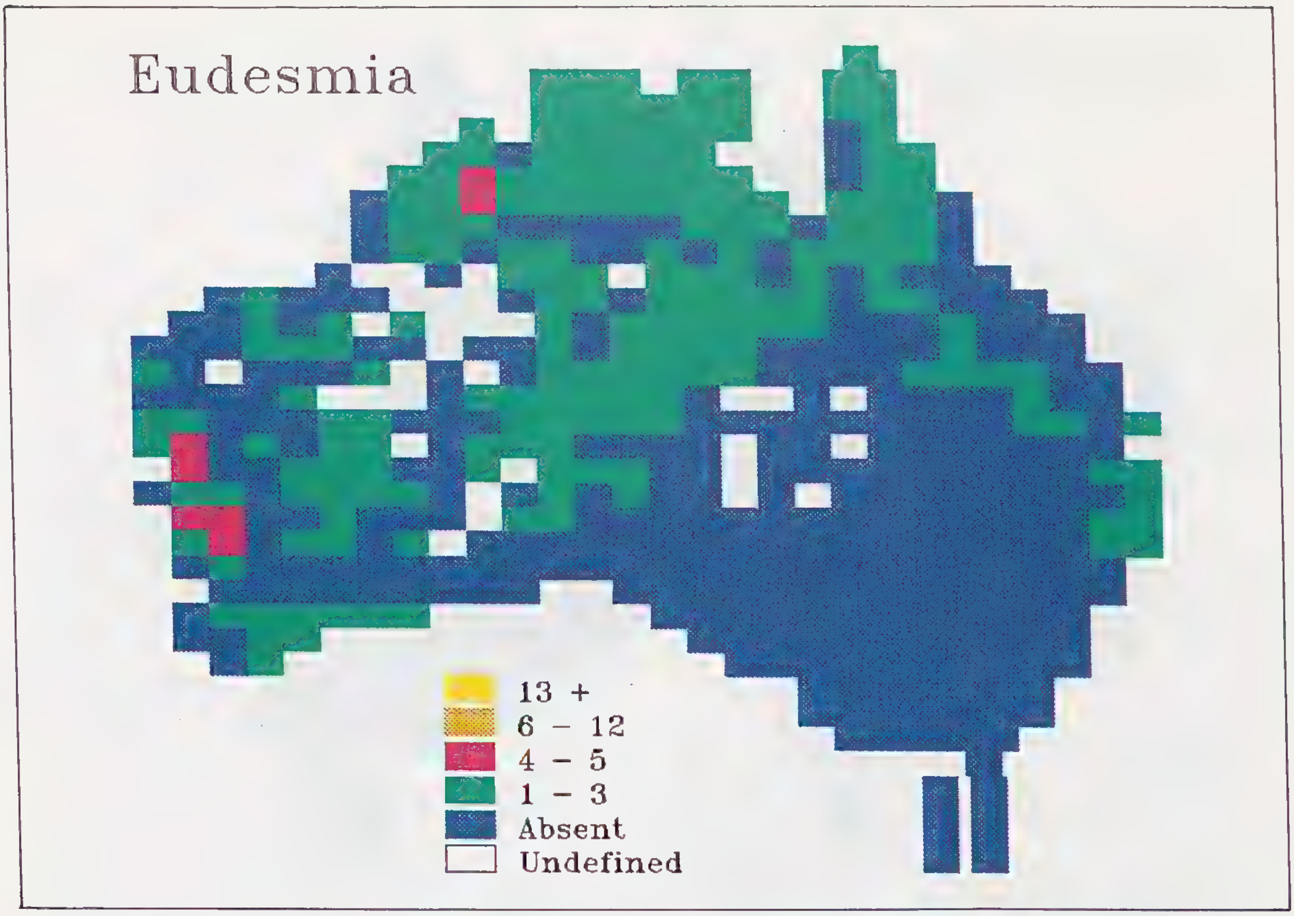


Figure 5 (continued)



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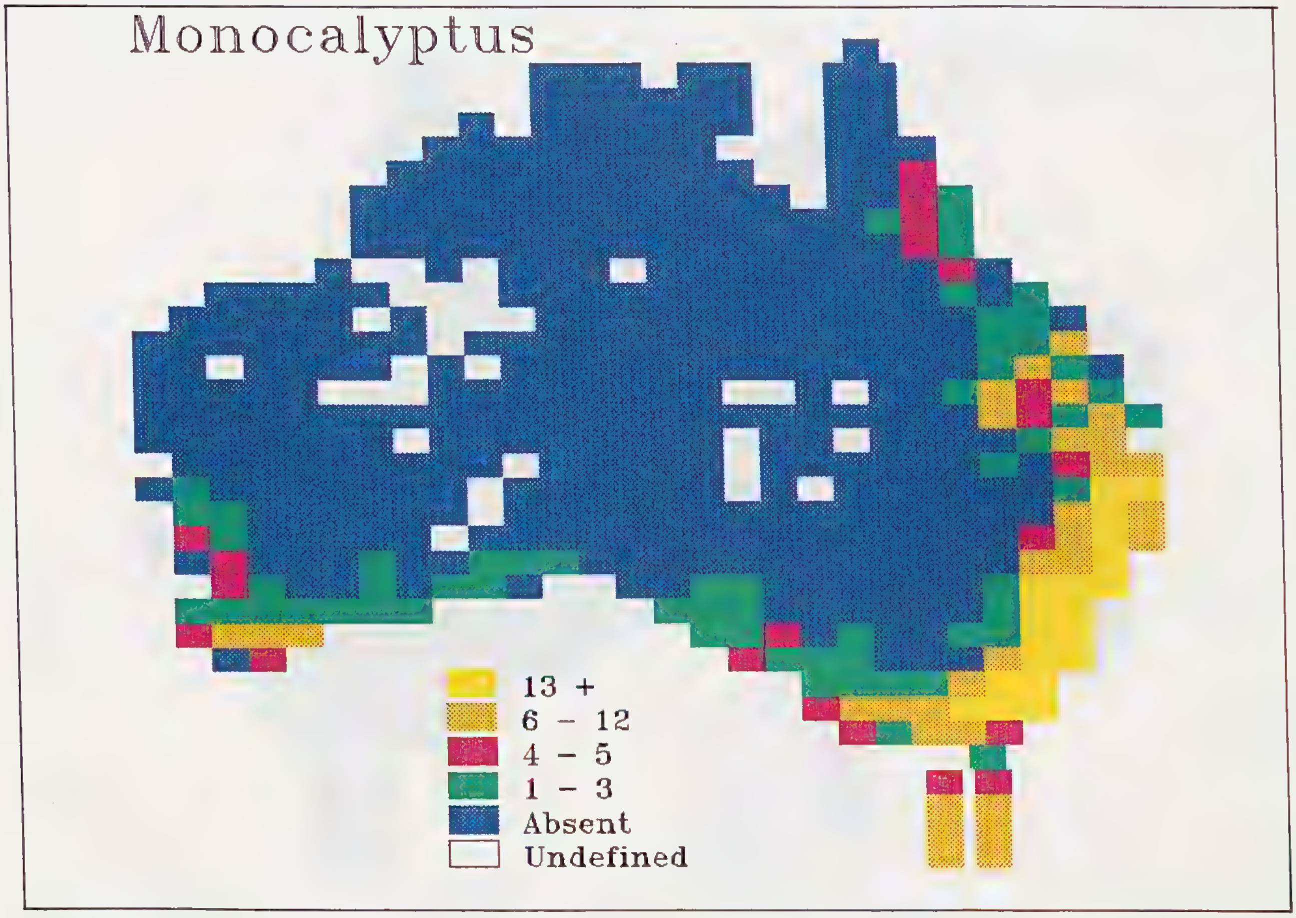

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(Table 6): these variables have more discriminant value because correlations between them were weak or of no statistical significance.

TEMPWETQ of 20°C effectively separated the northern (A, B, C, D, F and G) from the southern (I, K, L, O and P) zones. Among the northern zones, there was a gradient of RAINMAX from wettest to driest in the order C, D, F, B, A, G. Among the southern zones, O and P had higher values of RAINMIN than I, K and L, but O had substantially higher temperatures than P. Zone L had much higher RAINMAX than K and I which themselves had quite different values of RAINMAX.

Correlation analysis of weighted average meteorological variables for taxon groups suggested that the use of TEMPMAX, TEMPDRYQ, RAINMIN and RAINMAX would be appropriate for discrimination of groups as they were not significantly correlated with each other. The weighted average values for the main taxon groups are given in Table 7.

Taxon groups with high RAINMAX were *a, c, d, g, l, m, n, r, u* and *w*; relatively low RAINMAX groups *b, h, i, j, o, q* and *t* were all in southern Australia. The low RAINMAX guild divided into two groups according to RAINMIN with *b, h, i* and *j* all having values ≤ 20 and the others all being > 35 and confined to south-eastern Australia. *o, q* and *t* had a gradient of

Table 7. Average weighted values for TEMPMAX, TEMPDRYQ, RAINMIN and RAINMAX for 17 major taxon groups.

Taxon group	*TEMPMAX*	*TEMPDRYQ*	*RAINMIN*	*RAINMAX*
a	36.2	20.8	7	136
g	32.7	21.5	9	112
d	33.0	17.5	22	168
m	30.5	16.6	35	192
c	21.7	15.4	63	127
l	28.0	12.6	48	152
n	28.6	14.3	46	166
r	25.8	13.5	56	103
u	27.3	12.0	51	135
w	28.0	12.9	50	108
j	28.0	21.4	17	94
b	29.4	19.9	20	54
h	31.5	20.7	14	58
i	33.4	19.6	12	30
t	25.8	16.7	53	97
q	27.3	14.9	48	99
o	31.3	14.9	35	83

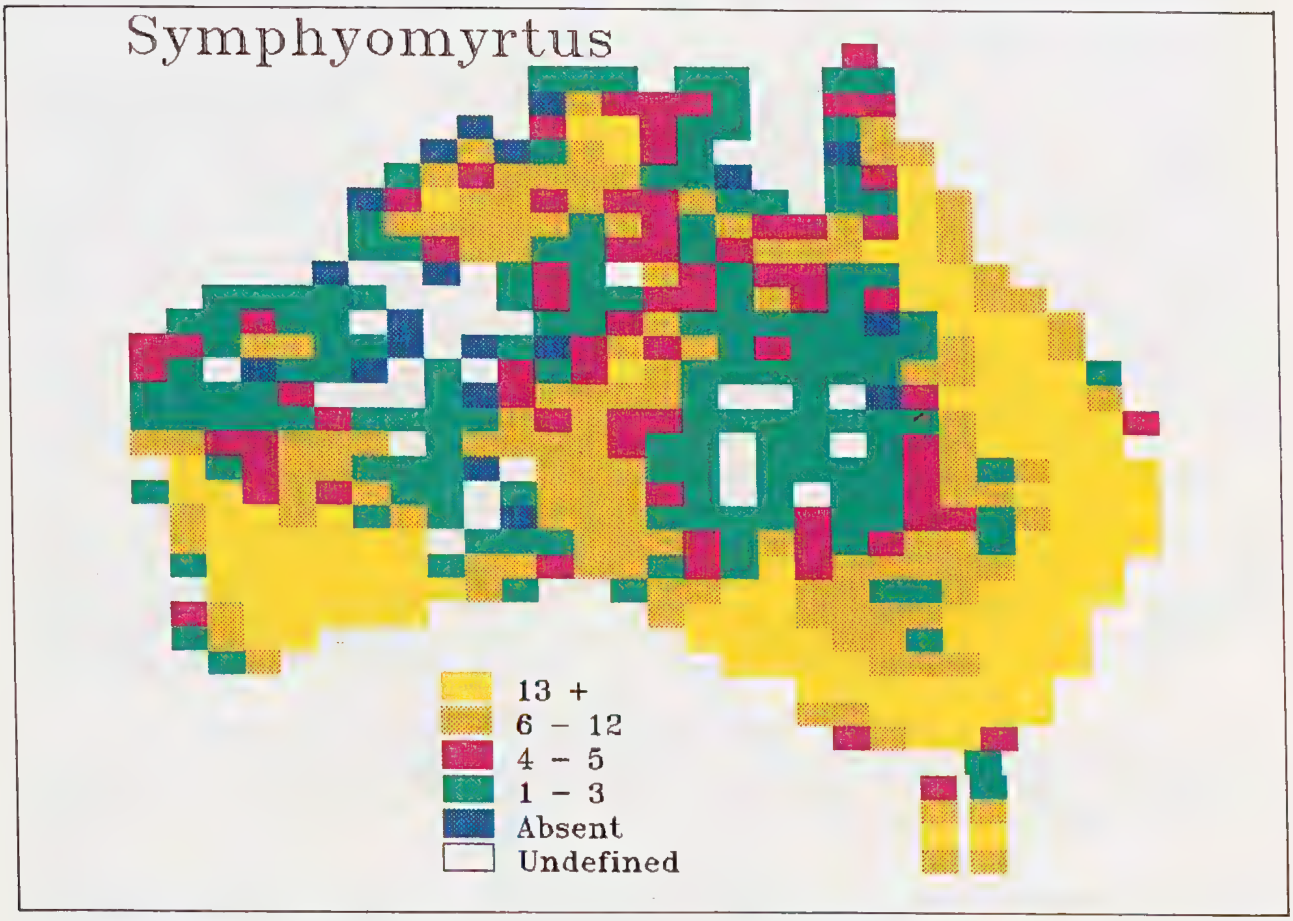

Figure 5 (continued)

values for TEMPMAX as did *b*, *h*, *i* and *j*. The high RAINMAX guild had groups *a* and *g* with low RAINMIN, groups *a*, *d*, *g* and *m* with TEMPMAX > 30°; and groups *c* and *r* with high RAINMIN.

When weighted averages for meteorological values associated with distributions of subgenera were calculated it was found that all temperature values, RAINMIN and RAINDRYQ tended to separate *Blakella*, *Corymbia* and *Eudesmia* from *Monocalyptus* and *Symphyomyrtus* (Table 8). Among the first three of these subgenera, *Eudesmia* had a relatively low RAINMEAN and *Corymbia* was distinguished from the other two subgenera by high values for RAINMIN and RAINDRYQ. In the second two subgenera, *Symphyomyrtus* was found in generally warmer and drier climates.

For all taxa combined, trends in the values of taxon density versus meteorological values (e.g. RAINMIN, RAINDRYQ) suggested the possibility of a correlation between taxon density and drought. Using the map of Walker (1981) for average length of dry period, it was found that average taxon density per dry-period zone was negatively correlated with the length of dry period ($r = -0.754$, $n = 12$, $P < 0.01$).

Discussion

(a) *General*

The evolutionary record for *Eucalyptus* is meagre and provides no evidence below the level of genus. Even the antiquity of the genus remains vague: it can only be dated by fossils as Eocene-Oligocene or Miocene (see Martin 1982). The patterns discerned here cannot be explained evolutionarily except by inference from the palaeoclimatic or palaeobotanical record, or from morphological evidence.

The search for patterns in the eucalypt landscape of Australia has had a long history. For example, Herbert (1929) recognised many regions on the basis of their apparent species richnesses. Among them were ten nodes of high species richness (around the coast) and the large species-impoverished inland region. Unfortunately, no map was published. More recent contributions, also subjective, have been those of Pryor and Johnson (1981) and Beadle (1981).

Pryor and Johnson (1981) identified five major 'ecogeographic' regions of *Eucalyptus* in Australia: they were northern Australia, non-tropical eastern Australian mainland, Tasmania, south-western Australia and Eremaea. These zones were determined subjectively according to the authors' extensive knowledge of the genus. Beadle (1981) has also had long experience with Australian vegetation: his approach, however, was to map numerous 'alliances' where the 'alliance' was a grouping of related eucalypt communities which had a uniformity of floristics and structure in a qualitative way (Beadle and Costin 1952). Thus, the alliance was a subjective mapping unit for vegetation akin to the 'zones' of this paper.

The zones produced by the methods used in our analysis differ from those published previously. The present results have been produced by repeatable, quantitative means. While our zones differ from others in general, there are some similarities in parts. The zones defined by Beard (1980) for Western Australia, for example, could often be matched with ours if his boundaries based on vegetation type were selected without reference to his 'provinces' or 'districts'. There was a similarity between Beadle's (1981) 'vegetation region' number one and our northern Australian zone (C). Our zone I, called 'Bight and east' in Table 2 has no counterpart although it shows similarities with portions of the map of mallee vegetation of Specht (1981).

While zones (or areas of land with similar species composition) have been the focus of biogeographic research in Australia, the advent of computer systems has enabled taxon groups to be identified as well. Despite this, there are no data which compare directly with ours. The nearest comparison is

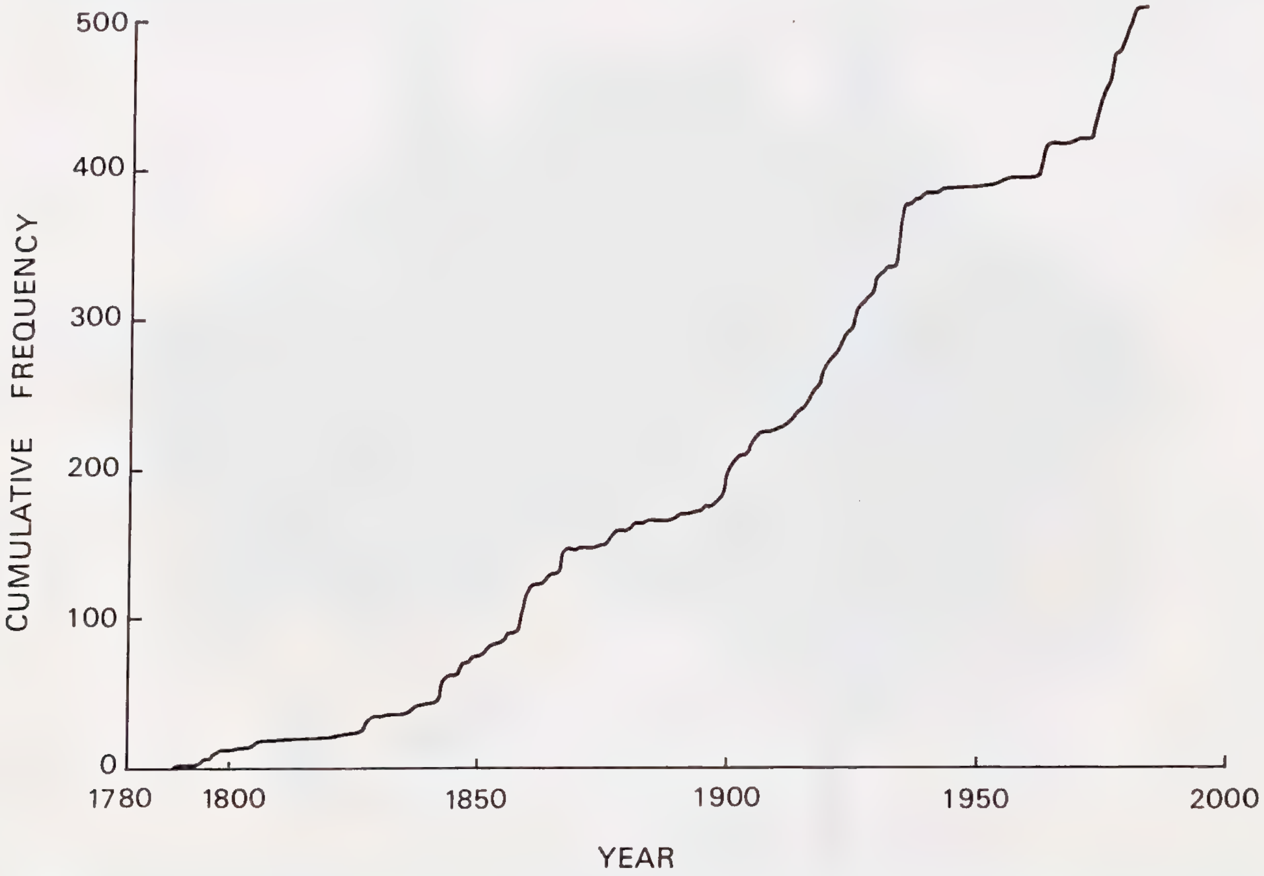

Figure 6. Cumulative frequency of taxa used in this analysis against time. Data were kindly supplied by the Australian Bureau of Flora and Fauna. The y-axis should be regarded as an index rather than an absolute value.

from the analyses of Austin and Belbin (1980) on the data of Booth (1978*a*, *b*) using the TWOSTP algorithm (Belbin 1980). Booth's data were then the best available, but incomplete. It was for forest trees only, for eastern Australia only, included 15 non-eucalypts among the 111 taxa used, and used a grid cell a third smaller than in this study.

It was in 1971 that the first comprehensive listing of taxa according to subgeneric groups appeared (Pryor and Johnson 1971). The distribution of these groups has been described (Pryor and Johnson 1981), but only recently mapped (Ladiges and Humphries 1983). The introduction of richness of taxa in the mapping of these groups has now enabled nodes of richness to be identified (Fig. 5).

Three major types of patterning in *Eucalyptus* landscapes have been identified — zones, taxon groups and nodes of richness. How should these be interpreted? Comparisons can be made between these patterns, and the patterns may be related to patterns of 'sampling' or to environment. Below, an interpretation of the results in the light of a sampling hypothesis, an environmental hypothesis and a palaeoecological hypothesis is attempted.

(b) *The sampling hypothesis*

The sampling hypothesis in its most extreme form would be that the patterns observed were simply an artefact of collecting bias. Consider, for example, the proposition that the continent has a uniform taxon richness and composition or that it has a uniform richness but varying composition. These are trivial propositions perhaps for the continent as a whole, and demonstrably incorrect, but not as readily dismissed for certain portions of Australia. If there were an area with a uniform species composition that was sampled poorly, and especially so if species richness was low, we might expect to obtain a few groups from the classification of MSD (and even a few gaps) that were scattered about rather than contiguous. This is the type of distribution that was found for the western arid region (Fig. 2) where the sampling index was low and taxon richness usually from 0 to 5 taxa per MSD. The similarity between this presumed theoretical result and the results of the zonal classification do not prove the sampling hypothesis, but they do lend credibility to it.

While our index of collection, herbarium specimens per taxon per MSD, is more appropriately tied to regions than to specific taxa, it may be noted that most taxon groups were located in regions of relatively high sampling index. For zones, the index was found to be related to average taxon density when the data were logarithmically transformed. The greater the taxon density, the higher the collection index. One interpretation of this result would be that all zones have been inadequately sampled. This view tends to be reinforced by the locations of new taxa: the last ten taxa of Fig. 6 (described in 1980 and 1981) were from zones C, I, K, O and P where average collection indexes (Table 2) varied from nine to fifteen. Thus a high collection index does not denote exhaustive collection of the variation present in the zone. It is clear from Fig. 6 also that our 'sampling' of the taxonomic variation of the genus may not yet be complete.

Variation in the data was introduced by the choice of the 1:250 000 mapsheet scale of sampling. Many MSD overlapped the coastline and had a reduced land area compared with those in the interior. This reduced the potential for eucalypt presence in coastal MSD. This sort of bias may account for some geographic outliers in the classification of MSD, e.g. Heron Island, Qld (as an outlier of zone C), but also classificatory outliers with little apparent relationship to major groups. Thus, Rottnest Island (W.A.), Medusa Banks (W.A.), Irwin Inlet (W.A.) and Sale (Vic.) were all coastal MSD with less than potential land areas and with relatively few taxa when compared with adjacent MSD. However, this sort of bias did not account for all classificatory outliers. Other single MSD which did not join with others even at the 20-group level (Fig. 1) could not be accounted for in this way. The unique MSD of Warri with its single and endemic taxon *E. rameliana* may have a sampling explanation in that it was named from a solitary fragmentary specimen collected in 1877 and never again collected (Chippendale and Wolf 1981). There were five other zones of only 1 MSD (e.g. Naretha, Turee Creek, Loongana and Westwood — all in W.A.). These were noted for having only one to three taxa.

Choice of scale or 'quadrat' size has a number of implications besides overlapping of the coastline. A large quadrat usually involves more variation, less homogeneity, within the sample than a small one. Where a larger number of smaller quadrats are used, intermediate groups may appear in a classification which may indicate shallower gradients in composition, for example, than are apparent using a coarser grid. Too many individuals, however, creates enormous computing loads.

It was apparent in this study that some zones had contiguous subzones. To some extent, this may reflect the steepness of gradients in the landscape. Usually, in more subjective methods, this problem has been countered by using variable scales (e.g. Pryor and Johnson 1981, Beadle 1981), a technique that could be further explored for future computer analyses.

It is important to recognise the scale at which the study was done in order to interpret the results. At the scale of this study, the broad view is pre-eminent. But, there is another aspect to this as well. Consider the maps of taxon-density for the various subgeneric groups and the identification of taxon-rich nodes. If a subgenus had large numbers of taxa (like *Symphyomyrtus* with 366), is it likely that the subgenus would cover a much larger area than a smaller one like *Monocalyptus* (with 115 taxa) purely on the basis of chance? Again, will more nodes be identified in a large subgenus than in a smaller one, or should apparent nodes of a few taxa — like that of *Symphyomyrtus* in north-western Australia — be generally ignored when other nodes are of such large numbers? We are inclined to the view that nodes should be identified and compared on the basis of an equal chance, which is easier to calculate for comparisons between taxon-rich subgenera, but much less so for the smaller ones. The identification of nodes proved to be most difficult for *Blakella* (9 taxa), *Corymbia* (38), and *Eudesmia* (16).

Sampling was involved for the meteorological data too. The data for each MSD were fitted from data for meteorological stations markedly biased in distribution to more settled areas. Data taken to be representative of the MSD were calculated for the midpoint of the MSD — which is not necessarily the most appropriate point. That some of the MSD were assigned a below zero rainfall suggests care should be taken in interpretation of environmental results.

Table 8. Average weighted values for TEMPMIN, RAINMEAN, RAINMIN and RAINDRYQ for 5 subgenera of *Eucalyptus*.

Subgenus	*TEMPMIN*	*RAINMEAN*	*RAINMIN*	*RAINDRYQ*
Blakella	11.8	832	7	29
Corymbia	10.4	832	12	46
Eudesmia	10.3	681	6	26
Monocalyptus	4.1	947	45	149
Symphyomyrtus	5.9	633	23	78

(c) *The environmental hypothesis*

Because meteorological data were our only computed environmental data, our environmental hypothesis was considerably limited. Certain correlations with vegetation type have been mentioned previously, however. Any correlation with soil type may be difficult to discern at the scale used here but one case in which it may be apparent is the break in the distribution of zone C at the Gulf of Carpentaria where an area of clay soils, supporting grasslands, divides the northern forests and woodlands (Beadle 1981).

Zones, taxon groups and subgeneric groups all partition according to environmental variables. Lack of normality in the data, however, make statistical comparisons suspect. Autocorrelation between variables makes discernment of causal variables impossible.

Zones and subgeneric groups tended to divide into northern and southern sections. For zones, the main northern groups (A, B, C, D) combined at the 20-group level to form a zone which was most of the continent north of 29°S. Subgeneric groups had major nodes in the south (*Symphyomyrtus* and *Monocalyptus*) or largely in the north (*Blakella, Corymbia* and, less so, *Eudesmia*). Among the zones, all the northern areas had TEMPWETQ >20°C and the southern all <20°C. Similarly, *Blakella, Corymbia* and *Eudesmia* were found in warmer climes than *Monocalyptus* and *Symphyomyrtus*. Taxon groups seemed to separate on the basis of rainfall.

Having recognised zones and taxon groups and subgeneric groups, it is appropriate to ask in which ways are these groupings useful. Subgeneric groups are believed to be natural because of the observation that interbreeding between members within them is possible, but between members of different groups it is not known (Pryor and Johnson 1981); this suggests that these groups have evolutionary significance. The same is *not necessarily* true of zones or taxon groups: their relevance may be more for the conceptual convenience of the observer in simplifying a complex data set or for their use as indicators of environment.

Often, establishment of zones has been followed by an analysis of endemic taxa. In our analysis, endemic taxa were positively correlated with numbers of taxa in the zone; the same is true for the more subjective zones of Pryor and Johnson (1981) in which number of endemics were proportional to total taxa ($r^2 = 0.98$, $n = 5$, $P < 0.01$). Our results focus attention on the importance of the relationship between endemism and species richness, and not just on endemism and geographic isolation.

(d) *The palaeoecological hypothesis*

The working hypothesis that we used was that eucalypts evolved from a closed-forest (= rainforest) stock and radiated into ever-drier environments from the margins of closed forest (after Herbert 1929 and Gill 1965) through megatherm and mesotherm ancestors.

The paucity of evidence from the fossil record has been already mentioned, but it is important to keep in mind. *Eucalyptus* may have emerged first in the Eocene-Oligocene period or as late as the Miocene (Martin 1982). As the Tertiary period progressed there was a shift in the composition of the closed-forests (that so dominated Australia) from gymnosperms to angiosperms. During the Miocene, a shift from subtropical closed-forest to a more temperate closed-forest may have occurred. Eucalypt forest may have made its first appearance while zones of increasing aridity in central Australia began emerging (Kemp 1981). Many of the marsupials, so species-rich in eucalypt forests today (Tyndale-Biscoe and Calaby 1975) also appeared in the fossil record about this time (Tyndale-Biscoe 1973). Both marsupials and eucalypts are believed to have radiated since the Upper Miocene or Pliocene and particularly in the Pleistocene (Gill 1965, 1975). It was, perhaps, in the Pleistocene that eucalypt woodland became widespread as there was a shift from the climatic pattern of moderate rainfall *without* a marked dry season (of the late Miocene and Pliocene) to a 'seasonal climate *with* a marked dry season, (Martin 1978). Recently, Nix (1982) has emphasised the importance of climatic seasonality in the 'ecological sifting . . . of ancestral stocks'.

The trend observed in the relationship between the numbers of eucalypt taxa and the lengths of dry periods calculated by the GROWEST model as used by Walker (1981) appears consistent with the current theories of habitat evolution from the Miocene to the present. However, the data set was dominated by the subgenus *Symphyomyrtus* so more careful examination according to subgeneric distributions was appropriate. While a strong relationship between length of dry period and taxon richness was found for *Monocalyptus* (115 taxa) and a weaker relationship was found with *Symphyomyrtus* (366 taxa), there was no correlation of this with numbers of taxa in the other three subgenera.

Meteorological variables such as length of dry period may be crude measures of more complex variables such as the pattern of soil dryness. Drainage, microclimates due to topographic variation, and soil characteristics may all be important in influencing the supply of water to the plant. In turn, the supply of water to the plant may influence uptake of nutrients, and susceptibility to pathogens and insects.

The three warmer-climate subgenera *Blakella, Corymbia* and *Eudesmia* (Table 8) have richnesses that do not appear to correlate well with length of dry period (at least when used as averages over large areas). However, for both *Blakella* and *Corymbia* there were statistically significant correlations between number of taxa and RAINMAX — although data were skewed. *Eudesmia* showed no correlation co-efficient against any variable better than *ca.* 0.2 ($n = 199$). It seems to be a group of doubtful coherence (Carr and Carr 1968, Pryor and Johnson 1981, Ladiges and Humphries 1983).

The presence of geographic disjunctions at subgeneric level (within *Monocalyptus* and *Corymbia*) suggests that subgeneric distributions have ebbed and flowed during their evolutionary history.

Soils data have had to be largely ignored in this analysis due to their unavailability, yet soils are undoubtedly important in eucalypt distribution. Just how they affect distribution varies from place to place. Their potential evolutionary significance for *Eucalyptus* has been mentioned as far back as 1913 (Andrews 1913). Being a flat ancient landscape there has been much scope for various epochs of soil formation to leave their legacies in Australia. However, on a continental basis, our knowledge of the interaction of soils and climate in affecting *Eucalyptus* is inadequate.

Our simple palaeoecological hypothesis has assumed an Australian origin for the genus and was based on accumulated knowledge of vegetational history and the weighted meteorological averages for each subgeneric group (Table 8). The hypothesis was thus independent of the debate or whether eucalypts had a monophyletic or polyphyletic origin (Pryor and Johnson 1981).

Conclusions

1. The large matrix of taxon presence-and-absence against sites represented as 1:250 000 mapsheets was classified successfully as eleven major zones with similar eucalypt composition, and seventeen major taxon groups with taxa of similar distribution.
2. Taxon groups were most frequently found in eastern and south-western Australia.
3. Patterns in the richness of taxa of subgeneric groups were found: greatest richness was found in four areas and coincidence of regions of richness between groups was common.
4. The increasing trend in numbers of taxa identified with time indicated that this study was a progress report rather

than the final word in phytogeographic classification. The collection index also suggested there was potential for change.

5. Some classificatory outliers were likely to be due to problems of sampling coastal areas using large 'quadrats'.
6. Zones, taxon groups, and subgeneric groups could be related to the ten meteorological variables used.
7. Three subgenera were most common in warm climates (*Blakella, Corymbia* and *Eudesmia*), one in cool climates (*Monocalyptus*), and one wide-spread one which predominated in cool climates (*Symphyomyrtus*). The two cool climate subgenera had taxa distributed according to the length of the dry period each year.
8. Further research on the causes of distribution of subgeneric groups particularly in relation to soils is needed. *Eudesmia*, in particular, may require attention to its intra-generic taxonomy.

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Appendix 1

List of all Australian 1:250 000 mapsheets in which the presence of *Eucalyptus* has been recorded. The location of the mapsheet, the group to which is was assigned (i.e. zone), the number of taxa present (#TX), the number of herbarium specimens of *Eucalyptus* collected (#Herb SPS) and various environmental measures are shown.

Map #	*Map name*	*Lat S*	*Long W-E*	*Group code*	*# TX*	*# Herb SPS*	*Elev-ation*	*TEMP. MEAN*	*TEMP. MIN.*	*TEMP. MAX.*	*TEMP. WETQ*	*TEMP. DRYQ*	*RAIN MEAN*	*RAIN MAX.*	*RAIN MIN.*	*RAIN WETQ*	*RAIN DRYQ*
1	ABMINGA	26	13351350	A	3	7	293.0	21.5	4.8	38.0	28.4	14.9	149.1	21.1	2.6	57.1	19.8
2	ABROLHOS	28	11251140	R	1	6	0.0	19.6	9.4	31.7	16.5	20.8	512.2	119.8	0.8	305.8	11.1
3	ADAVALE	25	14401455	A	1	7	286.8	21.9	5.0	36.7	24.6	15.7	330.3	53.3	11.8	150.4	43.4
4	ADELAIDE	34	13801395	I	33	1454	33.5	16.9	6.2	30.6	12.2	22.5	392.6	46.6	18.0	137.3	59.0
5	AJANA	27	11401155	K	21	199	218.2	20.9	7.9	36.2	14.4	23.3	365.1	86.3	3.2	210.8	17.7
6	ALBANY	35	11701185	L	20	134	0.0	15.2	7.2	25.0	12.0	20.6	889.9	135.6	18.3	379.9	67.0
7	ALBERGA	26	13201335	A	8	65	521.5	20.1	3.2	36.9	12.6	21.1	187.3	19.6	9.1	53.8	37.7
8	ALCOOTA	22	13351350	A	8	29	567.9	22.5	5.4	38.1	27.0	16.4	250.1	37.4	6.2	105.2	30.4
9	ALICE SPRINGS	23	13351350	A	14	183	669.8	21.3	4.1	37.4	26.1	14.9	246.0	30.9	9.8	89.0	41.9
10	ALLIGATOR RIVER	12	13201335	C	24	392	11.6	27.8	17.6	36.5	28.6	25.0	1430.0	321.3	0.9	908.9	10.5
11	ALROY	19	13501365	A	6	81	223.9	25.3	9.3	38.5	29.9	20.3	395.6	85.0	3.9	233.9	14.6
12	ANA BRANCH	33	14101425	I	8	36	55.9	17.7	4.5	33.4	14.6	20.5	261.0	25.9	17.9	71.7	60.4
13	ANDAMOOKA	30	13651380	A	3	3	69.5	19.8	5.6	35.7	26.5	20.0	198.7	22.7	11.9	60.3	36.1
14	ANGLEDOOL	29	14701485	A	8	46	138.7	19.7	3.2	35.0	23.2	15.7	381.5	50.5	20.7	130.5	69.6
15	ANKETELL	20	12151230	A	1	1	197.2	26.6	9.9	39.7	31.1	24.6	400.1	119.2	–2.9	293.8	–4.6
16	ARNHEM BAY	12	13501365	C	15	166	51.2	26.8	17.5	34.1	28.3	24.4	1214.0	248.0	2.3	722.9	13.8
17	ASHTON	15	12601275	C	17	151	346.5	25.5	9.1	36.7	28.5	21.8	800.3	201.9	4.9	540.7	19.4
18	ATHERTON	17	14401455	D	45	1068	503.6	22.6	10.6	33.0	25.3	19.4	887.2	212.3	6.3	599.4	21.5
19	AUGATHELLA	25	14551470	D	7	29	368.6	21.3	4.7	35.4	23.0	15.2	456.8	60.8	19.5	176.8	68.9
20	AUGUSTA	34	11401155	L	7	64	0.0	16.6	10.5	26.0	13.7	21.2	1114.8	236.9	0.5	630.6	17.7
21	AURUKUN	13	14101425	C	7	41	4.3	26.7	18.5	34.2	27.8	26.0	1425.8	324.5	5.9	938.0	25.6
22	AUVERGNE	15	12901305	C	26	179	62.8	27.5	12.6	38.0	29.8	24.5	773.8	189.9	–0.2	479.1	4.8
23	AVON DOWNS	20	13651380	A	7	23	212.2	24.8	8.1	38.7	30.1	19.2	307.9	60.4	4.9	166.5	19.4
24	AYERS ROCK	25	13051320	A	12	61	542.1	20.9	3.5	37.3	25.3	14.4	197.9	26.4	7.4	70.5	33.3
25	AYR	19	14701485	D	11	40	0.0	23.9	13.9	31.5	27.0	22.4	1320.1	298.5	21.8	829.5	73.3
26	BAIRNSDALE	37	14701485	O	53	910	224.8	13.4	2.4	27.2	10.6	19.1	916.7	95.9	59.3	260.1	182.4
27	BALFOUR DOWNS	22	12001215	A	3	12	458.7	25.0	8.6	40.0	31.0	22.1	285.0	71.9	0.8	173.4	9.4
28	BALLADONIA	32	12301245	K	29	191	157.6	17.3	5.8	30.5	15.3	19.3	309.7	32.4	16.5	94.5	55.5
29	BALLARAT	37	14251440	P	29	190	326.9	12.9	3.0	26.8	7.6	18.5	793.4	93.5	40.1	257.9	132.6
30	BALRANALD	34	14251440	I	11	73	60.5	17.0	3.7	33.0	13.7	19.7	289.0	27.8	20.6	76.4	67.7
31	BARALABA	24	14851500	D	31	113	193.5	21.3	5.8	33.2	22.5	16.1	664.5	111.2	23.7	301.7	80.7
32	BARKER	35	13801395	I	33	2062	14.2	15.5	7.2	25.3	12.1	19.7	465.5	58.0	19.1	167.8	61.2
33	BARLEE	29	11851200	K	10	54	424.5	19.9	5.5	36.0	13.3	19.4	222.1	31.8	5.6	78.4	22.7
34	BARMATO	31	14401455	I	9	122	144.4	18.9	3.9	34.4	25.9	12.5	287.4	29.0	18.3	86.2	57.9
35	BARROW CREEK	21	13351350	A	12	63	464.2	23.9	7.3	38.5	26.4	18.1	272.7	47.9	4.3	131.0	22.0
36	BARTON	30	13201335	I	11	167	179.6	18.5	5.5	32.5	12.2	24.2	204.8	31.2	6.9	82.6	28.6
37	BATHURST	33	14851500	O	48	703	917.1	12.1	0.2	25.8	19.2	12.5	923.3	101.7	58.4	281.6	185.5
38	BATHURST ISLAND	11	12901305	C	12	174	0.0	27.7	20.3	32.9	28.1	25.8	1548.4	353.2	–0.2	1015.7	4.0
39	BAUHINIA DOWNS	16	13501365	C	18	111	92.5	26.9	12.7	38.3	29.9	23.0	767.1	179.0	2.0	499.6	9.8
40	BEETALOO	17	13351350	A	10	4	240.2	26.4	11.2	38.1	29.9	22.2	595.5	133.1	2.8	369.7	11.4
41	BEGA	36	14851500	O	58	942	1017.4	9.9	–2.0	23.3	4.0	13.6	857.5	83.1	57.4	237.7	181.5
42	BELELE	26	11701185	G	7	71	485.5	22.2	6.5	38.5	15.0	21.8	261.2	49.3	8.3	113.3	27.8
43	BENCUBBIN	30	11701185	K	26	252	351.8	18.6	5.4	34.8	12.8	21.4	313.9	60.5	9.7	145.2	32.1
44	BENDIGO	36	14401455	P	18	254	130.8	15.1	3.2	30.4	11.8	21.8	494.3	48.4	34.1	137.2	106.9
45	BENTLEY	25	12601275	H	4	6	495.5	22.5	5.9	37.8	28.8	16.0	191.7	40.0	3.1	97.3	15.1
46	BETOOTA	25	13951410	A	2	3	60.0	23.4	6.3	39.4	30.1	16.7	230.8	57.4	1.4	142.2	7.7
47	BILLA KALINA	29	13501365	A	1	13	165.5	20.2	5.6	36.5	13.4	20.5	169.7	20.1	9.5	53.3	29.5

48	BILLILUNA	19	12751290	A	5	11	333.2	26.2	8.8	39.3	30.5	21.2	422.5	108.9	1.5	275.8	7.0
49	BIRDSVILLE	25	13801395	A	2	11	50.2	23.4	6.4	39.6	30.2	16.6	209.4	50.7	1.1	129.8	5.4
50	BIRKSGATE	27	12901305	I	9	64	424.9	20.4	4.6	35.9	26.0	17.5	169.5	20.6	7.7	53.6	31.3
51	BIRRINDUDU	18	12901305	A	6	25	394.2	25.9	8.8	38.5	30.0	21.2	487.1	116.7	3.6	301.5	12.0
52	BLACKALL	24	14401455	A	7	39	262.7	22.5	5.6	36.7	27.2	16.5	361.4	68.0	10.2	184.2	37.9
53	BLOODS RANGE	24	12901305	A	9	53	485.0	22.5	5.2	38.0	28.7	16.1	203.5	38.7	3.5	96.3	18.4
54	BLUE MUD BAY	13	13501365	C	9	102	4.0	27.0	16.7	35.3	28.7	24.4	1141.3	239.4	2.3	694.8	13.6
55	BONNEY WELL	20	13351350	A	11	89	387.0	25.1	9.3	38.7	30.0	19.7	319.8	63.1	3.9	170.7	17.1
56	BOOLIGAL	33	14401455	I	6	72	92.1	17.7	3.5	33.3	24.5	11.5	318.6	31.9	21.2	90.2	68.2
57	BOORABBIN	31	12001215	K	35	755	425.2	17.6	4.7	33.2	14.5	20.5	271.7	29.1	15.2	84.5	47.8
58	BOULIA	22	13951410	A	1	0	212.6	24.4	7.6	38.9	27.7	18.4	280.3	66.3	3.4	167.4	14.9
59	BOURKE	30	14551470	I	10	42	136.8	19.4	3.5	34.9	24.3	12.8	332.1	39.3	21.0	105.7	65.6
60	BOWEN	20	14701485	D	15	102	170.6	23.3	10.9	32.7	26.7	19.5	888.5	202.6	12.7	539.0	51.3
61	BREMER BAY	34	11851200	K	44	238	0.0	15.8	6.5	26.2	12.1	21.9	650.1	87.9	21.5	245.3	70.5
62	BRIGHTON DOWNS	23	14101425	B	2	2	134.8	24.1	7.2	38.6	26.3	18.0	324.1	80.8	3.2	201.3	14.7
63	BRISBANE	27	15301545	D	38	400	0.0	20.3	10.0	28.0	23.9	16.5	1720.6	248.7	57.2	699.8	237.1
64	BROKEN HILL	31	14101425	I	7	129	242.7	18.7	5.3	33.1	11.8	22.7	241.5	23.3	16.6	63.7	56.7
65	BROOME	17	12151230	C	15	58	9.5	26.9	14.8	34.4	29.4	25.5	701.2	203.1	−0.6	519.2	0.1
66	BROWNE	25	12451260	A	4	7	461.5	22.8	6.2	38.2	29.1	16.3	186.1	43.9	0.8	107.0	7.4
67	BRUNETTE DOWNS	18	13501365	A	4	26	219.9	25.8	10.5	38.2	29.9	21.2	485.4	108.5	3.4	300.0	13.3
68	BUCHANAN	21	14551470	D	23	61	309.2	23.3	8.1	35.2	27.3	18.8	623.0	135.0	11.4	358.2	40.4
69	BULLOO	28	14251440	A	4	8	100.4	21.3	5.0	37.1	25.2	14.6	223.4	40.1	7.4	102.7	26.8
70	BUNDABERG	24	15151530	D	23	56	0.0	22.2	12.6	29.6	25.5	20.3	1170.8	193.2	36.7	512.2	143.3
71	BURKETOWN	17	13951410	A	9	28	0.0	27.4	15.8	36.4	29.7	24.2	906.0	240.7	3.9	657.9	13.0
72	BURNABBIE	32	12601275	I	11	22	0.0	17.5	6.5	29.4	12.9	19.3	313.5	40.5	15.4	109.6	50.2
73	BURNIE	41	14451465	P	17	523	561.5	9.0	2.0	19.5	5.3	13.2	1696.8	198.0	82.8	562.8	263.1
74	BURRA	33	13801395	I	21	345	448.7	14.4	3.2	29.3	8.5	20.4	563.0	68.5	25.5	200.5	88.1
75	BUSSELTON	33	11401155	L	8	127	0.0	16.9	9.8	26.8	13.7	22.3	1061.3	235.2	2.1	614.6	18.7
76	BYRO	26	11551170	A	5	12	328.3	22.3	7.6	38.6	15.9	25.3	270.2	58.4	6.2	136.4	20.2
77	CAIRNS	16	14551470	D	18	3	0.0	24.9	18.2	30.9	27.1	23.6	2365.1	507.9	42.9	1417.9	131.2
78	CALLABONNA	29	13951410	A	4	1	40.7	21.0	5.7	37.5	28.0	14.4	179.9	31.7	6.3	83.2	19.9
79	CALVERT HILLS	17	13651380	C	15	53	279.3	25.8	11.9	36.9	29.3	21.6	546.0	128.3	3.3	352.6	12.5
80	CAMBRIDGE GULF	15	12751290	C	29	266	8.8	29.1	15.9	39.3	31.1	24.6	721.2	186.4	2.4	475.3	18.6
81	CAMDEN SOUND	15	12301245	C	5	34	0.0	27.8	19.7	33.4	28.9	27.0	965.8	274.7	2.6	716.2	9.5
82	CAMOOWEAL	19	13801395	A	8	33	190.8	25.8	10.8	37.8	30.1	20.9	410.7	95.1	4.4	255.3	18.6
83	CANBERRA	35	14851500	O	66	1668	802.0	11.7	−0.7	25.5	14.1	8.6	779.7	77.2	55.2	224.7	176.3
84	CANTERBURY	25	14101425	A	2	6	153.5	23.0	5.9	38.8	26.9	16.3	229.5	53.4	3.2	134.2	14.5
85	CAPE MELVILLE	14	14401455	C	13	44	2.7	26.1	19.1	32.4	27.4	24.2	1741.8	378.7	16.6	1125.4	56.6
86	CAPE SCOTT	13	12901305	C	10	77	0.0	27.0	14.7	34.9	28.4	23.8	1277.4	333.3	0.6	859.6	6.8
87	CAPE WEYMOUTH	12	14251440	C	12	46	5.4	26.2	19.4	33.0	27.3	25.4	1740.5	378.3	8.8	1116.1	37.8
88	CARGELLIGO	33	14551470	I	17	135	176.8	17.2	3.0	32.3	17.6	11.1	448.2	46.2	27.9	123.5	99.1
89	CHARLEVILLE	26	14551470	A	10	90	301.8	21.2	4.4	35.7	26.1	14.9	406.2	53.3	18.8	151.3	66.7
90	CHARNELY	16	12451260	C	26	135	335.0	25.8	9.8	36.8	29.0	21.8	726.9	194.6	4.8	507.7	18.1
91	CHARTERS TOWERS	20	14551470	D	28	111	280.3	23.9	9.4	35.5	27.4	19.9	771.3	171.7	11.1	468.3	40.6
92	CHILDARA	31	13351350	N	2	9	150.7	18.2	5.6	32.7	11.9	24.0	255.0	37.3	7.7	105.3	32.2
93	CHINCHILLA	26	15001515	D	42	588	337.0	19.1	2.8	32.0	22.8	13.6	801.4	115.9	33.4	327.9	114.9
94	CHOWILLA	33	13951410	I	8	45	75.3	17.5	4.8	33.0	11.7	23.6	300.7	31.1	17.2	89.0	58.8
95	CLARKE RIVER	19	14401455	D	23	136	567.6	22.2	8.7	33.4	25.7	18.3	670.4	149.9	9.7	413.9	32.5
96	CLERMONT	22	14701485	D	22	94	340.2	22.0	7.3	33.5	26.3	17.4	687.5	134.1	17.0	348.2	61.6
97	CLONCURRY	20	13951410	A	9	74	207.7	25.6	10.2	38.2	30.2	20.5	399.2	98.1	3.8	253.5	16.7
98	COBAR	31	14551470	I	13	167	277.4	18.1	3.1	33.7	21.7	14.0	366.7	36.1	25.5	99.3	86.5
99	COBB	24	12601275	A	1	8	459.1	23.4	6.4	38.5	29.5	17.0	205.2	49.2	0.9	119.8	7.7
100	COBHAM LAKE	30	14101425	I	2	35	104.0	20.1	5.3	35.6	25.1	13.7	195.2	26.3	9.9	72.0	31.8
101	COBOURG PENINSULAR	11	13201335	C	16	132	0.1	27.3	19.5	33.8	28.1	25.5	1524.8	331.1	0.0	965.9	8.8
102	COEN	13	14251440	C	16	73	198.1	25.5	17.2	33.7	26.8	23.6	1309.2	310.9	3.5	891.4	16.1

APPENDIX 1

Map #	Map name	Lat S	Long W-E	Group code	# TX	# Herb SPS	Elev-ation	TEMP. MEAN	TEMP. MIN.	TEMP. MAX.	TEMP. WETQ	TEMP. DRYQ	RAIN MEAN	RAIN MAX.	RAIN MIN.	RAIN WETQ	RAIN DRYQ
103	COFFS HARBOUR	30	15301545	O	28	209	0.0	18.7	8.6	26.1	21.4	15.0	1766.6	241.7	66.2	667.2	264.3
104	COLAC	38	14251440	P	13	81	116.1	13.2	4.6	25.0	9.0	17.7	688.5	79.2	35.3	217.3	123.4
105	COLLIE	33	11551170	L	18	42	228.3	15.7	5.6	29.8	10.9	22.4	924.6	180.2	17.0	480.5	56.8
106	COLLIER	24	11851200	G	8	21	625.4	22.9	6.9	38.7	30.0	23.3	280.6	43.5	9.6	106.6	30.9
107	COOBER PEDY	29	13351350	A	2	21	147.6	20.0	5.9	35.4	13.7	20.3	172.2	22.6	10.0	57.9	32.4
108	COOK	30	12901305	I	3	9	145.7	18.2	5.4	31.1	12.6	20.2	192.2	30.7	11.5	70.8	34.6
109	COOKTOWN	15	14401455	D	31	342	183.1	25.3	16.5	33.6	26.9	23.1	1297.7	315.8	7.1	887.8	24.0
110	COOMPANA	31	12901305	I	6	36	3.0	17.6	6.3	28.8	13.0	22.4	246.0	36.9	11.4	93.3	39.4
111	COOPER	26	12751290	A	10	40	511.3	21.3	5.1	36.8	24.2	14.9	186.0	28.9	6.9	71.2	28.0
112	COOTAMUNDRA	34	14701485	I	18	430	285.1	15.6	2.1	31.7	12.1	20.0	636.8	61.4	47.7	170.8	146.4
113	COPLEY	30	13801395	I	12	272	479.2	17.5	3.6	33.8	24.2	17.6	237.6	29.5	13.4	73.2	43.3
114	CORDILLO	26	13951410	A	3	18	57.7	22.9	6.1	39.4	29.8	16.0	202.9	48.9	1.5	120.9	7.8
115	CORRIGIN	32	11701185	K	42	530	311.4	16.5	4.6	32.1	10.5	23.5	415.4	75.2	9.4	202.9	34.5
116	CROSSLAND	19	12451260	F	2	4	204.6	27.1	10.2	40.0	31.0	25.9	473.7	136.3	−0.7	344.5	2.3
117	CROYDON	18	14101425	C	18	119	63.0	27.0	13.4	38.7	29.7	23.4	888.3	219.3	6.2	608.4	22.8
118	CUE	27	11701185	M	4	41	422.5	21.6	6.4	38.0	14.7	25.1	252.6	49.1	7.1	112.3	24.4
119	CULVER	32	12451260	I	16	49	13.5	17.7	6.5	29.8	12.9	19.5	320.7	36.6	16.1	103.6	54.5
120	CUNDEELEE	30	12301245	K	24	84	302.4	18.9	5.4	34.0	24.7	18.9	200.4	23.2	10.6	67.3	35.1
121	CUNNAMULLA	28	14551470	A	7	4	158.5	20.6	4.0	35.8	25.7	16.4	324.1	45.1	16.7	120.5	54.9
122	CURDIMURKA	29	13651380	A	3	27	0.0	20.9	6.2	36.7	27.5	17.6	183.4	28.4	7.3	76.4	26.8
123	CURNAMONA	31	13951410	A	5	2	97.8	19.2	5.4	34.7	25.8	13.1	216.4	24.1	15.0	63.8	47.8
124	DALBY	27	15001515	D	36	293	349.0	18.7	2.1	32.2	24.6	12.9	763.9	109.2	35.5	303.2	120.1
125	DALHOUSIE	26	13501365	A	2	14	111.8	22.4	6.0	38.6	29.3	15.8	157.0	30.4	0.6	82.7	9.5
126	DALY WATERS	16	13201335	C	14	82	269.4	26.5	10.9	38.1	29.6	22.7	712.0	160.1	2.6	443.6	11.6
127	DAMPIER	20	11551170	A	5	20	0.0	26.0	14.4	35.7	30.4	25.7	346.7	77.3	1.1	184.6	7.2
128	DARWIN	12	13051320	C	19	199	10.0	27.7	18.7	34.7	28.3	25.3	1557.6	351.8	0.2	1002.8	5.1
129	DEAL ISLAND	39	14631478	P	5	26	7.2	13.7	5.7	23.1	9.9	17.8	775.2	83.3	44.3	235.9	143.0
130	DELAMERE	15	13051320	C	22	133	162.9	26.8	11.1	38.0	29.3	21.9	872.8	205.2	1.3	558.0	9.4
131	DENILIQUIN	35	14401455	I	9	73	87.2	16.1	3.2	32.0	9.3	18.8	379.2	36.4	25.9	103.5	84.0
132	DERBY	17	12301245	C	19	199	12.7	28.5	15.5	38.6	30.6	27.6	726.7	210.4	0.4	541.7	2.3
133	DIRRANBANDI	28	14701485	D	9	73	164.8	20.3	3.5	35.2	23.8	16.2	385.0	52.7	19.7	141.4	63.9
134	DIXON RANGE	17	12751290	A	10	27	267.5	26.9	10.0	39.2	30.2	22.6	571.9	144.0	2.4	373.5	11.3
135	DOBBYN	19	13951410	A	9	25	104.0	26.4	11.8	38.0	30.2	21.9	581.5	149.3	3.8	398.9	15.7
136	DONGARA	29	11401155	K	18	310	0.0	19.4	9.0	32.0	14.8	20.8	541.8	124.8	4.1	319.5	19.9
137	DONORS HILL	18	13951410	A	10	21	39.9	27.0	13.9	37.4	30.0	23.2	755.9	198.7	4.0	538.6	14.5
138	DORRIGO	30	15151530	O	73	549	1080.6	12.6	0.0	24.1	19.7	7.5	1086.5	142.4	58.8	388.1	186.3
139	DRYSDALE	14	12601275	C	18	155	105.3	27.2	14.0	36.6	28.9	23.2	952.8	247.6	3.8	660.9	20.6
140	DUARINGA	23	14851500	D	41	364	116.5	21.9	7.5	32.6	23.8	17.0	762.9	146.1	20.0	372.2	76.2
141	DUBBO	32	14851500	O	59	505	484.4	15.4	1.1	30.2	18.2	15.7	584.0	56.6	41.7	160.3	130.3
142	DUCHESS	21	13951410	A	6	3	312.9	24.8	9.1	38.2	28.3	19.2	282.3	64.7	4.4	165.9	18.1
143	DUKETON	27	12151230	G	3	5	541.2	21.2	5.3	37.3	28.1	17.5	198.1	30.9	5.9	80.3	24.2
144	DUMBLEYUNG	33	11701185	K	44	568	303.8	15.6	4.6	30.1	10.2	22.3	592.6	99.9	12.0	280.5	44.5
145	DURHAM DOWNS	27	14101425	A	3	11	80.9	22.1	5.6	38.5	26.0	15.3	204.0	44.5	3.5	111.0	14.6
146	EDDYSTONE	25	14701485	D	32	125	531.6	19.8	3.9	33.2	24.1	14.1	641.4	87.4	28.5	236.7	99.1
147	EDEL	26	11251140	R	8	53	0.0	21.3	9.5	34.5	17.2	22.8	329.1	71.9	−1.3	193.0	8.7
148	EDJUDINA	29	12151230	A	3	3	360.9	19.9	5.5	35.7	26.3	16.4	169.4	26.3	3.5	77.0	15.5
149	EINASLEIGH	18	14401455	D	38	346	705.5	21.1	8.9	31.0	24.4	17.4	830.2	190.3	9.5	541.1	32.4
150	ELKEDRA	21	13501365	A	7	58	379.3	24.0	7.4	38.8	29.7	18.2	250.4	43.0	4.3	118.3	20.4
151	ELLISTON	33	13351350	I	10	64	0.0	16.7	7.0	27.8	12.3	21.3	378.5	55.0	8.4	162.4	39.5
152	EMERALD	23	14701485	D	24	190	247.3	22.0	6.4	34.1	25.8	16.9	625.0	112.4	18.5	300.5	63.5
153	ENNGONIA	29	14551470	A	6	21	134.2	20.0	3.7	35.5	24.8	15.8	318.8	42.2	18.2	111.1	58.8

154	EBAGOOLA	14	14251440	C	12	88	207.8	25.7	16.4	34.5	27.1	23.5	1096.0	280.6	1.4	778.4	4.8
155	EROMANGA	26	14251440	A	5	12	156.3	22.2	5.3	37.8	24.3	13.9	248.6	50.4	6.2	129.2	24.1
156	ESPERANCE	33	12151230	K	50	358	153.0	16.2	5.7	28.7	11.5	19.5	397.6	45.4	18.5	129.1	58.6
157	EUCLA	31	12751290	I	12	74	119.9	17.4	5.4	30.0	12.3	19.2	231.1	36.0	12.4	85.4	38.2
158	EULO	28	14401455	A	5	61	154.0	20.9	4.4	36.4	25.8	12.7	265.0	39.7	12.1	105.6	41.4
159	EVERARD	27	13201335	A	12	51	367.7	20.3	4.3	36.6	13.2	21.0	160.3	18.9	7.0	48.3	29.2
160	FERGUSSON RIVER	14	13051320	C	23	230	144.9	26.7	11.6	37.3	28.7	22.4	1071.3	265.4	1.5	698.2	8.3
161	FINKE	25	13351350	A	8	30	304.7	22.0	4.8	38.5	28.8	15.4	161.7	25.0	1.4	67.7	17.0
162	FLINDERS ISLAND	40	14651485	P	7	45	0.0	13.4	4.9	23.1	9.4	17.5	636.0	70.8	34.9	206.1	116.6
163	FOG BAY	12	12901305	C	2	277	0.0	27.5	18.0	34.0	28.2	25.0	1458.9	349.3	0.7	963.7	5.4
164	FORBES	33	14701485	I	26	626	222.2	16.9	2.8	32.5	23.8	10.6	520.7	53.7	33.9	149.3	113.0
165	FORREST	30	12751290	I	1	1	181.9	18.4	5.3	31.9	15.9	20.8	182.8	29.4	9.0	62.5	33.6
166	FOWLER	31	13201335	I	12	93	89.5	17.7	6.0	30.0	12.3	22.5	240.6	37.5	2.9	104.2	24.1
167	FREW RIVER	20	13501365	A	7	31	277.2	24.8	8.3	38.8	29.9	19.3	310.4	61.3	4.4	168.3	16.6
168	FROME	30	13951410	A	4	16	29.9	20.3	5.7	36.2	27.1	14.0	193.3	28.2	9.4	76.6	29.5
169	GAIRDNER	31	13501365	I	4	36	121.2	18.6	5.4	34.0	11.8	21.2	252.8	33.9	13.4	94.9	41.8
170	GALBRAITH	16	14101425	A	4	12	16.6	27.4	16.4	36.7	29.0	24.9	1109.1	276.2	6.4	771.5	20.9
171	GALILEE	22	14551470	D	11	41	324.8	22.7	6.9	35.0	27.3	17.8	545.6	110.0	12.7	287.8	45.0
172	GASON	27	13801395	A	1	8	38.0	22.3	6.1	39.1	29.4	15.5	173.8	38.4	2.5	99.1	8.6
173	GEORGETOWN	18	14251440	C	27	130	269.6	25.2	11.5	37.3	28.0	21.6	758.3	183.5	4.4	499.8	20.7
174	GERALDTON	28	11401155	K	21	326	175.3	20.1	7.9	34.8	14.2	24.5	449.9	107.8	4.2	270.5	17.8
175	GILBERTON	19	14251440	B	4	22	430.0	23.9	9.6	36.0	26.7	19.7	502.4	125.2	4.9	316.7	20.5
176	GILES	28	13201335	I	7	23	273.5	20.0	5.0	35.6	13.4	20.5	159.3	21.0	8.4	52.1	29.8
177	GILGANDRA	31	14851500	O	34	299	506.9	15.8	0.6	31.1	18.9	16.1	550.8	57.8	34.8	164.0	111.7
178	GLENBURGH	25	11551170	A	2	3	343.9	23.1	8.2	39.3	16.5	26.4	257.5	53.0	6.0	123.7	19.5
179	GLENGARRY	26	11851200	G	10	46	579.4	21.9	5.9	38.1	14.4	21.9	252.9	40.6	9.1	94.5	30.3
180	GLENORMISTON	22	13801395	A	4	15	163.3	24.4	6.8	39.4	30.6	17.9	263.8	59.2	3.2	153.6	13.3
181	GOONDIWINDI	28	15001515	D	36	797	252.2	18.9	2.5	32.7	24.9	15.4	687.5	97.8	32.8	268.0	108.9
182	GORDON DOWNS	18	12751290	A	10	30	366.4	26.2	8.9	38.9	30.1	21.4	495.5	125.0	3.1	320.4	11.1
183	GOULBURN	34	14851500	O	50	535	716.4	12.6	−0.1	27.0	15.1	13.0	879.5	85.8	62.0	239.0	196.1
184	GOVE	12	13651380	C	10	0	0.0	26.6	18.4	33.1	28.2	25.6	1207.8	252.3	2.7	709.3	8.7
185	GRAFTON	29	15151530	O	67	440	827.9	14.5	0.5	25.9	21.9	9.5	1001.7	148.8	52.7	389.6	163.6
186	GUNANYA	23	12151230	A	1	0	396.3	24.7	7.8	40.0	30.8	21.9	235.0	65.3	−2.4	158.6	−0.9
187	GYMPIE	26	15151530	D	47	510	354.8	18.5	4.5	29.4	22.9	13.8	1186.4	182.1	44.5	508.9	152.9
188	HALE RIVER	24	13501365	A	6	9	220.5	23.1	5.7	39.3	29.8	16.5	177.5	32.4	0.5	88.5	11.3
189	HAMILTON	37	14101425	P	19	389	183.7	13.4	4.1	26.7	8.7	18.6	647.9	80.0	31.1	224.8	99.1
190	HANN RIVER	15	14251440	C	12	35	127.8	26.3	16.3	35.4	27.7	24.0	1084.8	278.2	2.1	768.5	9.6
191	HASTINGS	31	15151530	O	56	483	542.3	15.1	1.5	26.9	19.9	10.1	1030.7	146.9	51.1	390.6	165.3
192	HAY	34	14401455	I	3	62	88.0	16.9	3.3	32.8	23.8	19.8	333.6	30.7	24.0	87.2	77.4
193	HAY RIVER	23	13651380	A	2	0	180.6	23.8	6.1	39.6	30.3	17.1	207.5	42.4	2.1	112.9	10.9
194	HELEN SPRINGS	18	13351350	A	11	36	227.2	26.3	10.8	38.6	30.2	21.7	499.0	111.6	2.8	306.0	11.1
195	HENBURY	24	13201335	A	17	224	489.2	21.4	3.2	38.1	26.8	14.9	199.8	28.3	4.5	77.8	26.6
196	HERBERT	25	12301245	A	3	4	473.4	22.9	6.3	38.5	29.4	16.3	189.5	45.2	0.3	110.7	7.4
197	HERMANNSBURG	23	13201335	A	20	768	713.4	21.1	3.7	37.2	25.1	14.7	264.9	35.7	11.1	99.3	44.8
198	HERON ISLAND	23	15151530	C	3	0	0.0	23.3	16.2	29.3	26.1	21.7	1233.5	208.3	33.2	569.9	131.2
199	HIGHLAND ROCKS	21	12901305	A	6	19	428.4	24.6	7.1	39.0	29.9	18.9	300.2	70.2	1.6	176.8	10.1
200	HILL RIVER	30	11401155	L	14	191	0.0	18.9	9.5	30.7	14.7	18.9	656.3	150.1	5.7	384.6	22.0
201	HOBART	43	14651485	P	17	261	0.0	11.9	4.3	20.5	10.6	15.4	851.7	82.2	53.8	241.1	178.4
202	HODGSON DOWNS	15	13351350	E	5	17	131.1	26.9	12.7	38.1	29.5	23.5	884.6	202.5	1.9	559.4	11.2
203	HOLROYD	14	14101425	F	2	5	13.6	27.0	18.0	35.0	28.2	25.1	1290.2	306.8	6.0	871.0	22.7
204	HOMEBOIN	27	14701485	A	4	23	248.8	20.7	4.0	35.0	24.2	12.9	442.4	56.9	22.9	158.6	78.5
205	HORSHAM	36	14101425	P	25	307	157.0	14.4	3.7	29.5	9.6	20.2	447.9	50.8	23.0	141.7	80.8
206	HUCKITTA	22	13501365	A	10	91	474.4	23.0	6.1	38.5	26.4	16.9	223.0	32.4	4.9	92.4	25.9
207	HUGHENDEN	20	14401455	D	29	291	604.3	21.8	7.7	33.3	25.8	17.5	597.2	127.4	11.8	346.8	38.9
208	HYDEN	32	11851200	K	40	177	342.4	16.6	4.6	31.9	11.6	19.3	343.3	44.5	15.1	126.3	51.2

Map #	Map name	Lat S	Long W-E	Group code	# TX	# Herb SPS	Elev-ation	TEMP. MEAN	TEMP. MIN.	TEMP. MAX.	TEMP. WETQ	TEMP. DRYQ	RAIN MEAN	RAIN MAX.	RAIN MIN.	RAIN WETQ	RAIN DRYQ
209	ILLOGWA CREEK	23	13501365	A	5	20	344.6	23.0	5.6	39.1	29.5	16.6	195.8	30.7	2.2	83.8	19.2
210	INGHAM	18	14551470	D	25	39	0.0	24.0	13.6	32.1	26.9	20.6	2098.7	444.3	35.3	1314.2	112.1
211	INNAMINCKA	27	13951410	A	3	35	36.6	22.4	6.0	39.4	29.5	15.5	190.8	43.7	2.2	109.2	9.4
212	INNISFAIL	17	14551470	D	17	10	0.0	24.0	15.6	31.2	26.7	22.5	3119.5	623.5	70.3	1690.3	225.7
213	INVERELL	29	15001515	O	39	693	486.3	16.8	0.4	31.4	21.2	13.3	666.9	94.3	31.1	253.9	101.2
214	IPSWICH	27	15151530	D	48	738	265.1	18.6	4.2	30.1	23.3	13.7	1140.7	169.8	44.3	479.5	153.5
215	IRWIN INLET	35	11551170	X	3	6	0.0	15.6	8.5	25.2	12.6	20.1	1032.1	185.0	8.7	516.6	41.8
216	IVANHOE	32	14401455	A	3	54	93.1	18.4	3.8	33.9	25.3	12.1	305.7	32.3	18.7	92.9	60.5
217	JACKSON	30	11851200	K	19	49	426.4	18.7	5.1	34.7	12.5	18.0	250.3	33.5	8.3	88.2	31.1
218	JARDINE RIVER	11	14101425	C	6	34	0.0	26.5	20.0	32.8	27.5	25.7	1640.4	356.9	4.0	1055.3	21.2
219	JERICHO	23	14551470	D	22	105	375.9	22.0	5.9	35.0	24.5	16.7	509.5	90.4	15.5	241.1	54.9
220	JERILDERIE	35	14551470	I	9	34	128.6	15.9	2.8	31.7	8.9	22.8	502.2	53.9	34.3	148.7	107.2
221	JULIA CREEK	20	14101425	A	5	32	123.5	25.7	10.4	38.2	29.9	21.0	585.6	145.7	4.6	388.4	19.4
222	JUNDAH	24	14251440	B	1	2	174.1	23.2	6.2	37.9	26.5	17.0	310.7	71.1	5.5	180.6	22.4
223	KALGOORLIE	30	12001215	K	32	669	450.1	18.7	4.9	34.6	22.8	18.3	231.3	26.5	10.1	73.7	34.9
224	KATHERINE	14	13201335	C	36	796	212.9	26.6	12.3	37.4	28.8	22.2	1020.9	235.9	2.2	646.8	11.2
225	KELLERBERRIN	31	11701185	K	38	721	314.0	17.6	4.9	33.7	12.3	20.5	329.7	62.8	9.5	158.3	31.5
226	KENNEDY RANGE	24	11401155	A	1	4	138.6	23.8	10.0	39.1	18.1	26.2	249.6	50.2	3.3	125.6	10.8
227	KIMBA	33	13501365	I	19	496	88.9	16.8	5.9	29.8	11.4	21.9	390.7	55.7	12.7	163.3	46.2
228	KING ISLAND	40	14451465	P	10	37	0.0	12.9	5.8	21.8	9.6	16.6	1064.1	126.9	50.7	360.2	168.1
229	KINGOONYA	30	13501365	I	5	14	158.1	19.4	5.4	35.3	13.0	22.5	204.9	26.3	12.1	71.6	38.0
230	KINGSCOTE	35	13651380	I	25	500	0.0	15.7	9.0	23.6	12.4	19.3	519.7	77.6	19.3	220.1	62.6
231	KINGSTON	26	12151230	G	7	3	477.5	22.3	6.1	38.3	29.1	18.8	180.4	37.6	1.0	95.2	9.7
232	KIRKALOCKA	28	11701185	M	5	38	382.7	20.7	6.2	37.2	14.2	24.0	259.3	50.8	7.4	116.6	24.2
233	KOPPERAMANNA	28	13801395	A	3	8	20.4	21.7	6.0	38.4	28.7	15.0	173.4	34.4	4.1	90.5	13.8
234	KULGERA	25	13201335	A	8	59	468.6	21.0	3.3	37.7	25.0	14.4	181.7	23.0	5.2	64.0	28.6
235	KURNALPI	30	12151230	K	25	112	374.6	18.8	5.2	34.4	25.0	15.3	205.1	25.3	9.5	71.7	33.0
236	LAGRANGE	18	12151230	C	7	3	120.0	26.7	11.8	36.5	30.1	25.1	580.5	169.6	-0.9	427.0	-0.1
237	LAKE AMADEUS	24	13051320	A	15	87	530.0	21.6	3.8	37.9	24.5	15.2	208.8	32.8	5.4	86.3	26.9
238	LAKE JOHNSTON	32	12001215	K	35	756	315.5	16.8	4.9	31.7	11.9	19.3	313.0	33.5	16.6	95.5	56.7
239	LAKE MACKAY	22	12901305	A	1	11	420.9	24.1	6.5	38.9	29.7	18.2	256.0	58.7	1.1	147.2	9.5
240	LANDER RIVER	20	13201335	A	4	11	367.4	25.2	8.9	38.9	30.1	20.0	336.1	71.4	2.6	189.0	13.1
241	LANSDOWNE	17	12601275	C	16	110	391.0	25.9	8.8	38.2	29.6	21.4	600.1	155.0	4.4	402.1	15.5
242	LARRIMAH	15	13201335	C	22	129	177.2	26.8	11.7	38.1	29.3	21.9	885.6	206.4	1.8	561.9	11.2
243	LAUNCESTON	41	14651485	P	19	431	746.2	8.2	0.2	18.9	4.8	12.5	1198.6	117.2	74.8	337.5	226.8
244	LAVERTON	28	12151230	K	13	37	435.3	20.7	5.5	36.7	27.4	17.1	171.3	28.4	3.0	78.3	14.8
245	LAWN HILL	18	13801395	C	14	69	96.7	26.5	12.9	37.1	30.0	22.3	599.6	156.2	3.0	421.5	12.0
246	LENNARD RIVER	17	12451260	C	22	140	173.9	27.4	12.0	39.0	30.3	26.7	665.5	185.9	2.5	481.3	10.3
247	LENNIS	27	12601275	G	1	6	472.9	20.8	5.2	36.3	27.1	14.4	176.8	27.2	6.8	67.3	26.4
248	LEONDOA	28	12001215	G	6	53	409.5	21.0	5.8	37.1	27.9	17.0	170.3	28.0	1.3	80.4	10.3
249	LIMBUNYA	17	12901305	C	7	43	387.7	26.0	9.1	38.3	29.7	21.6	573.2	136.5	3.7	357.5	13.3
250	LINCOLN	34	13501365	I	25	711	82.3	16.2	8.1	26.1	12.2	20.3	478.8	71.5	13.7	206.1	49.6
251	LINDSAY	27	13051320	I	7	10	440.0	20.0	4.0	36.0	13.0	20.8	174.4	20.8	9.1	52.3	34.6
252	LISSADELL	16	12751290	C	18	109	240.8	26.9	10.5	38.8	29.9	23.1	662.2	163.5	2.8	431.5	13.9
253	LONDONDERRY	13	12601275	C	5	13	0.0	27.8	18.3	34.8	28.7	25.0	1113.0	287.5	2.1	773.7	17.2
254	LONGREACH	23	14401455	D	13	77	246.7	23.0	6.4	36.6	25.6	17.4	401.6	84.8	8.9	223.3	33.0
255	LOONGANA	30	12601275	W	1	0	206.0	18.8	5.4	33.0	16.1	18.8	191.7	25.5	10.3	61.6	35.1
256	LOUTH	30	14401455	I	8	118	113.0	19.8	4.2	35.2	26.0	13.2	269.6	33.5	15.7	90.9	48.4
257	LUCAS	20	12751290	E	4	6	386.3	25.6	8.0	39.1	30.3	20.1	360.9	92.3	1.1	231.6	6.9
258	MACDONALD	23	12751290	A	5	11	468.6	23.7	6.4	38.6	29.6	17.5	231.2	53.5	1.6	131.6	10.5

259	MACHATTIE	24	13951410	A	2	1	112.6	23.7	6.5	39.4	27.0	17.1	242.5	59.7	1.8	148.1	9.4
260	MACKAY	21	14851500	D	23	41	23.2	22.6	10.8	30.9	26.2	18.5	1530.7	336.4	21.2	888.0	94.4
261	MACKUNDA	22	14101425	B	3	7	171.9	24.5	7.9	38.3	26.0	18.7	363.6	90.3	3.7	226.8	16.2
262	MACLEAN	29	15301545	D	30	264	0.0	19.0	8.6	26.6	22.7	15.3	1657.7	226.6	60.9	629.1	243.9
263	MADURA	31	12601275	I	8	48	135.3	18.1	5.7	31.8	13.5	20.5	237.9	32.0	13.1	78.5	43.3
264	MAITLAND	34	13651380	I	15	238	0.0	16.7	8.2	26.4	12.3	21.1	427.7	59.2	17.9	170.8	58.8
265	MALCOLM	33	12301245	K	29	240	15.6	16.7	6.4	27.9	12.5	18.5	403.3	47.3	18.6	136.1	59.0
266	MALLACOOTA	37	14851500	O	54	504	139.9	13.9	4.0	24.7	15.3	9.9	868.8	84.5	60.1	237.8	199.8
267	MANARA	32	14251440	I	3	11	68.6	18.6	4.4	34.0	25.3	12.5	249.6	27.1	15.0	76.4	49.6
268	MANDORA	19	12001215	F	1	1	0.0	27.1	12.2	37.6	31.0	25.1	484.2	140.4	–3.0	350.2	–5.8
269	MANEROO	23	14251440	B	2	3	225.9	23.5	6.7	37.7	25.4	17.6	337.2	77.7	5.6	199.9	22.7
270	MANILLA	30	15001515	O	47	1157	566.3	15.6	–0.5	30.4	21.8	12.2	692.7	95.1	34.8	255.1	114.6
271	MANN	26	12901305	A	8	79	618.7	20.4	4.0	36.4	25.7	21.4	215.9	24.4	12.3	64.6	45.9
272	MANUKA	21	14251440	B	1	3	250.6	24.4	8.4	37.3	28.9	19.3	465.6	111.7	5.3	288.0	21.9
273	MARBLE BAR	21	11851200	A	7	8	264.1	26.3	10.7	40.7	31.7	23.6	305.2	80.7	–1.3	192.9	2.3
274	MARREE	29	13801395	A	3	30	94.9	20.7	5.6	37.3	27.7	14.1	166.1	25.9	7.2	69.2	24.0
275	MARYBOROUGH	25	15151530	D	34	289	118.4	20.6	8.7	29.9	23.5	16.4	913.9	160.5	36.4	412.6	119.4
276	MASON	29	12751290	G	1	8	223.2	19.3	5.3	33.5	16.4	19.6	161.1	23.2	8.1	50.8	26.6
277	MAURICE	29	13051320	I	6	29	214.2	19.1	5.3	33.3	12.6	21.7	171.9	25.7	11.3	60.7	34.3
278	McDILLS	25	13501365	A	2	13	135.7	22.9	5.9	39.1	29.6	16.3	168.6	33.5	0.0	91.6	7.8
279	McKINLAY	21	14101425	B	1	4	217.9	24.9	8.9	38.1	29.7	19.6	404.2	100.1	4.0	254.4	17.5
280	MEDUSA BANKS	14	12751290	U	2	15	0.0	28.1	15.3	37.2	29.7	24.3	929.0	233.6	1.7	619.3	15.2
281	MELBOURNE	37	14401455	O	38	1101	278.3	13.4	3.1	27.5	8.6	19.1	810.1	86.8	44.8	242.9	150.1
282	MELVILLE ISLAND	11	13051320	C	17	36	1.0	27.5	20.5	32.8	28.0	25.6	1607.6	354.1	–0.4	1031.5	4.7
283	MENINDEE	32	14101425	I	7	52	81.6	18.5	4.9	33.8	25.1	12.6	236.7	24.6	15.9	65.0	53.4
284	MENZIES	29	12001215	K	28	293	390.0	20.0	5.5	36.0	26.7	16.1	176.9	27.0	2.6	79.0	13.9
285	MILDURA	34	14101425	I	13	295	58.2	16.8	4.1	32.6	13.7	23.0	295.6	29.6	17.9	85.8	63.0
286	MILINGIMBI	12	13351350	C	17	44	38.0	27.3	17.3	35.7	28.5	25.1	1308.6	279.9	1.4	808.0	12.1
287	MILLUNGERA	19	14101425	A	6	10	99.5	26.4	11.8	38.6	29.8	22.1	728.5	180.2	5.3	491.7	21.3
288	MILPARINKA	29	14101425	A	4	24	187.5	20.4	5.1	36.4	25.0	13.8	180.8	26.1	8.9	70.4	28.7
289	MINIGWAL	29	12301245	K	6	12	428.9	19.5	5.0	35.2	25.8	16.1	191.7	23.6	9.0	66.1	31.6
290	MINILYA	23	11251140	A	5	17	0.0	23.4	12.1	35.2	19.3	24.6	321.9	60.3	3.5	154.8	14.5
291	MITCHELL	26	14701485	D	15	79	410.1	20.3	4.0	34.2	25.2	14.3	588.3	71.5	28.9	195.5	100.4
292	MONTAGUE SOUND	14	12451260	C	7	71	0.0	28.0	19.6	33.8	28.9	27.4	1039.3	277.9	3.7	752.1	18.0
293	MONTO	24	15001515	D	40	294	317.2	19.8	4.5	31.5	23.4	14.9	848.5	139.1	29.4	373.7	101.9
294	MOORA	30	11551170	K	41	443	259.5	18.7	6.4	34.2	12.4	21.3	459.1	102.8	9.7	243.6	33.6
295	MOREE	29	14851500	A	11	44	166.6	19.3	2.8	34.2	24.9	15.5	461.9	61.1	23.0	157.1	83.6
296	MORNINGTON	16	13801395	B	4	16	0.0	27.2	17.0	34.7	29.3	24.1	915.4	245.2	1.8	674.7	5.9
297	MORRIS	23	12451260	A	1	0	393.0	24.5	7.2	39.2	30.2	18.3	232.2	65.0	–2.0	158.4	–1.6
298	MOSSMAN	16	14401455	D	30	466	355.6	23.7	12.5	33.8	25.9	20.9	1049.1	259.1	5.2	720.7	18.3
299	MOUNT ANDERSON	18	12301245	C	8	46	106.5	27.7	12.3	39.1	30.8	26.6	596.8	174.4	–0.5	443.1	0.8
300	MOUNT BARKER	34	11701185	K	53	907	224.5	15.0	5.2	27.9	10.5	21.6	742.6	116.9	15.6	329.9	57.3
301	MOUNT BRUCE	22	11701185	A	12	75	663.5	23.4	8.3	38.0	29.9	23.8	351.9	56.8	10.9	137.4	38.0
301	MOUNT COOLON	21	14701485	D	23	124	281.9	22.7	8.9	33.3	26.5	18.5	767.7	162.9	14.0	428.9	54.8
303	MOUNT DOREEN	22	13051320	A	7	29	580.4	22.8	5.2	38.2	27.6	16.7	269.8	49.6	5.6	129.4	25.7
304	MOUNT DRUMMOND	18	13651380	A	10	45	297.8	25.5	10.8	37.3	29.4	20.8	435.4	97.1	4.3	265.0	16.5
305	MOUNT EDGERTON	24	11701185	M	1	2	501.0	23.6	7.9	39.3	16.4	23.6	266.9	44.5	7.1	102.1	23.6
306	MOUNT ELIZABETH	16	12601275	C	27	234	407.7	25.6	8.6	37.3	29.0	21.3	692.0	175.7	5.1	462.7	18.4
307	MOUNT EVELYN	13	13201335	C	26	208	224.2	26.5	13.5	36.5	28.3	22.7	1161.5	262.7	2.3	734.1	11.0
308	MOUNT ISA	20	13801395	A	13	124	286.9	25.1	9.6	38.2	30.1	19.7	288.5	58.4	5.3	153.3	21.2
309	MOUNT LIEBIG	23	13051320	A	8	77	671.1	21.6	4.0	37.6	26.4	15.2	260.0	40.2	9.2	106.9	37.8
310	MOUNT MARUMBA	13	13351350	C	11	36	127.8	26.9	15.0	36.5	28.6	24.3	1146.2	250.9	2.0	711.0	12.8
311	MOUNT PEAKE	21	13201335	A	8	112	504.5	23.8	6.8	38.5	28.4	18.0	289.4	54.5	4.3	145.3	21.3
312	MOUNT PHILLIPS	24	11551170	A	4	3	327.1	24.0	9.0	40.0	17.4	23.7	250.9	48.4	4.8	112.7	16.4
313	MOUNT RAMSAY	18	12601275	A	11	81	271.5	26.8	9.8	39.5	30.5	22.2	519.7	139.6	1.9	358.0	8.9

Map #	Map name	Lat S	Long W-E	Group code	# TX	# Herb SPS	Elev-ation	TEMP. MEAN	TEMP. MIN.	TEMP. MAX.	TEMP. WETQ	TEMP. DRYQ	RAIN MEAN	RAIN MAX.	RAIN MIN.	RAIN WETQ	RAIN DRYQ
314	MOUNT RENNIE	23	12901305	A	8	25	544.1	22.8	5.3	38.2	27.9	16.5	238.1	46.4	4.5	116.3	21.3
315	MOUNT SOLITAIRE	20	13051320	A	5	2	408.2	25.1	8.0	38.9	30.0	19.7	344.3	77.0	2.5	198.8	12.1
316	MOUNT THEO	21	13051320	A	3	9	480.2	24.1	6.7	38.7	29.5	18.3	296.7	62.0	3.2	159.6	16.6
317	MOUNT WHELAN	23	13801395	A	2	4	116.4	24.1	6.6	39.6	30.5	17.5	247.8	58.1	2.1	149.7	9.5
318	MOUNT YOUNG	15	13501365	A	4	38	44.1	27.0	13.8	37.9	29.7	23.6	908.8	207.8	1.9	584.2	10.5
319	MUNDUBBERA	25	15001515	D	30	342	321.9	19.4	3.4	31.8	24.4	14.2	821.8	124.6	31.7	349.1	108.1
320	MURGOO	27	11551170	M	3	4	330.9	21.4	7.1	37.6	15.2	24.3	302.9	67.6	6.5	156.8	24.3
321	MURLOOCOPPIE	28	13351350	A	4	14	255.1	20.5	5.3	36.7	13.5	20.9	155.5	19.2	7.6	49.5	27.3
322	MUTTABURRA	22	14401455	B	5	24	226.9	23.5	7.2	36.5	27.9	18.3	462.6	105.7	7.7	273.0	28.8
323	NABBERU	25	12001215	A	7	9	568.3	22.7	6.3	38.7	29.8	23.2	229.2	40.6	5.3	100.9	22.2
324	NAPPERBY	22	13201335	A	11	82	661.0	22.1	4.8	37.7	23.6	15.9	277.2	43.6	8.4	119.2	35.6
325	NARACOORTE	36	13951410	I	18	363	29.1	14.6	4.9	27.8	10.0	19.5	572.9	76.6	20.9	220.8	68.7
326	NARETHA	31	12451260	J	1	1	149.6	18.3	5.8	32.1	15.9	20.7	244.8	27.0	14.4	76.0	46.3
327	NARRABRI	30	14851500	O	25	306	217.5	18.5	2.7	33.6	22.8	14.8	507.5	59.2	32.8	155.9	110.3
328	NARRANDERA	34	14551470	I	17	168	137.7	16.8	3.1	32.6	13.2	21.8	394.8	36.7	28.2	104.3	94.1
329	NARROMINE	32	14701485	I	20	315	224.8	17.5	3.0	33.0	24.4	11.2	470.0	52.6	29.6	146.1	95.9
330	NEALE	28	12451260	I	3	11	354.5	20.6	5.5	35.9	26.6	14.4	158.9	27.0	4.1	70.7	16.2
331	NEWCASTLE	32	15151530	O	46	160	7.2	17.2	5.1	26.8	21.6	12.9	1222.6	147.6	61.2	435.7	205.4
332	NEWCASTLE WATERS	17	13201335	A	12	96	233.8	26.6	10.8	38.5	30.1	22.5	604.0	137.8	2.2	374.8	9.8
333	NEWDEGATE	33	11851200	K	55	427	297.2	15.7	4.6	29.9	10.4	22.5	457.3	63.3	15.6	177.2	53.1
334	NEWMAN	23	11851200	F	3	7	630.7	23.4	7.6	38.7	30.2	24.0	300.9	52.5	9.4	127.3	30.5
335	NINGALOO	22	11251142	A	6	79	0.0	24.0	12.9	35.1	20.0	22.9	342.1	59.6	3.6	149.7	14.9
336	NINGHAN	29	11701185	K	13	88	318.0	19.9	6.0	36.3	13.8	22.9	260.5	50.4	7.2	117.3	23.2
337	NOONAERA	32	12751290	I	1	0	0.0	17.1	6.3	28.2	12.7	23.0	306.6	43.5	13.1	116.1	43.5
338	NOONKANBAH	18	12451260	A	12	56	90.5	28.1	12.4	40.4	31.1	27.3	582.4	166.2	0.2	428.0	3.0
339	NOORINA	28	12901305	I	9	80	371.5	19.6	4.6	34.8	13.3	20.2	169.9	22.7	9.7	52.8	33.2
340	NORMANTON	17	14101425	C	19	139	47.9	27.2	14.9	37.9	29.3	24.2	993.1	248.0	6.1	689.8	21.1
341	NORSEMAN	32	12151230	K	53	120	288.4	16.9	5.2	31.3	14.6	23.6	310.5	32.3	17.0	93.2	56.7
342	NULLAGINE	21	12001215	A	4	9	302.0	26.1	9.7	40.5	31.4	23.6	318.8	89.9	−2.1	217.1	−0.5
343	NULLABOR	31	13051320	I	9	59	0.6	17.6	6.5	28.6	12.9	20.0	242.8	37.1	6.3	98.9	31.4
344	NUYTS	32	13201335	I	1	44	0.0	17.0	6.8	27.5	12.5	20.8	296.5	45.4	2.0	130.6	25.6
345	NYMAGEE	32	14551470	I	11	112	289.6	17.4	3.0	32.9	10.5	20.5	411.4	40.2	30.0	107.9	98.3
346	NYNGAN	31	14701485	I	8	197	183.7	18.3	2.9	33.8	25.1	11.8	459.2	51.3	30.7	140.7	95.9
347	OATLANDS	42	14651485	P	25	1400	308.4	10.6	2.2	21.5	6.4	14.8	802.1	80.3	48.6	230.9	154.3
348	OLARY	32	13951410	I	11	34	309.3	17.0	4.3	32.1	10.8	19.7	345.1	38.7	19.5	110.0	66.5
349	ONSLOW	21	11401155	A	6	22	0.0	25.1	13.6	35.8	30.0	24.5	332.5	60.0	2.0	155.1	8.7
350	OODNADATA	27	13501365	A	3	27	157.9	21.7	5.7	38.1	28.7	18.4	144.0	23.6	2.7	63.7	16.2
351	OOLDEA	30	13051320	I	12	224	102.9	18.4	5.8	31.0	12.7	22.7	196.9	30.6	8.4	76.2	32.1
352	ORFORD BAY	11	14251440	C	8	0	0.0	26.4	20.2	32.5	27.2	25.5	1804.8	394.3	6.5	1161.8	31.0
353	ORROROO	32	13801395	I	20	505	390.0	16.0	3.7	31.4	10.2	18.5	396.8	46.1	21.3	134.3	72.3
354	OUYEN	35	14101425	I	14	253	87.5	15.7	3.8	31.5	12.6	21.7	344.3	36.5	20.0	101.9	67.9
355	PANDIE PANDIE	26	13801395	A	1	7	24.6	22.9	6.3	39.4	29.8	16.2	194.7	46.3	1.3	118.8	5.8
356	PARACHILNA	31	13801395	I	15	317	494.4	16.4	3.4	32.3	10.1	19.4	306.2	34.8	16.6	89.5	56.1
357	PEAK HILL	25	11851200	F	5	15	549.1	22.8	6.6	38.8	30.2	23.0	244.1	36.7	6.9	92.7	23.7
358	PELLEW	15	13651380	C	3	7	0.0	26.4	15.6	35.2	28.9	22.9	950.1	223.2	2.2	635.0	9.6
359	PEMBERTON	34	11551170	L	19	206	164.4	15.4	6.6	27.8	11.4	21.1	982.4	180.5	13.1	497.5	50.5
360	PENDER	16	12151230	F	2	7	0.0	27.2	17.3	33.6	29.0	25.9	804.6	230.5	0.3	594.5	3.0
361	PENOLA	37	13951410	P	13	461	4.6	13.9	5.6	25.6	10.1	18.3	750.9	107.1	23.4	306.0	80.3
362	PERCY ISLES	21	15001515	D	11	33	0.0	23.9	16.9	29.8	26.5	22.4	1267.1	241.2	22.7	666.8	94.0
363	PERENJORI	29	11551170	K	35	99	307.1	19.6	6.5	35.6	12.8	22.5	390.4	87.8	8.7	206.0	31.9

364	PERTH	31	11551170	L	31	350	165.7	18.0	6.8	32.8	12.5	20.3	576.8	127.1	9.9	320.5	33.2
365	PETERMANN RANGES	25	12901305	A	8	104	716.6	20.6	3.8	36.6	25.5	17.8	248.1	30.1	13.4	79.7	52.7
366	PINE CREEK	13	13051320	C	32	736	98.9	26.9	13.3	36.5	28.3	23.3	1317.4	330.9	1.6	867.2	6.7
367	PINJARRA	32	11551170	L	23	200	291.6	16.1	5.4	30.4	10.7	19.6	1017.7	222.9	17.6	556.7	57.6
368	PINNAROO	35	13951410	I	20	260	78.4	15.4	4.6	30.0	10.1	20.8	445.7	53.9	19.4	155.1	62.8
369	PLUMRIDGE	29	12451260	I	2	2	208.4	20.0	5.9	34.8	25.6	14.4	164.3	25.6	5.0	71.0	18.5
370	POONCARIE	33	14251440	I	7	12	79.4	17.7	4.0	33.5	24.4	11.7	267.5	26.5	17.9	73.2	60.0
371	PORT AUGUSTA	32	13651380	I	14	178	145.2	17.7	5.3	32.8	12.1	20.2	318.2	40.3	16.0	117.2	51.3
372	PORT CLINTON	22	15001515	D	20	85	0.2	23.2	14.1	30.4	26.4	21.5	1083.9	198.3	23.2	538.9	95.5
373	PORT DAVEY	43	14451465	P	12	153	0.0	11.4	4.5	20.0	8.3	14.6	1853.7	203.3	97.5	585.2	321.4
374	PORT HEDLAND	20	11851200	A	8	30	49.3	27.4	12.4	40.1	32.0	25.0	368.9	102.2	–2.5	246.5	–3.1
375	PORT KEATS	14	12901305	C	10	24	6.4	27.1	13.3	35.9	28.9	23.2	1019.8	252.2	–0.1	671.2	7.9
376	PORT LANGDON	13	13651380	C	9	2	0.0	26.7	17.5	34.0	28.4	25.6	1128.9	233.5	3.1	690.7	11.8
377	PORTLAND	38	14101425	P	10	126	0.0	13.7	6.2	23.0	10.2	17.5	796.3	99.8	33.0	286.8	114.0
378	PRINCE REGENT	15	12451260	C	20	109	86.0	27.5	15.7	35.6	29.1	26.9	925.5	253.9	4.8	673.6	16.9
379	PROSERPINE	20	14851500	D	14	26	0.0	23.4	13.9	30.5	26.4	21.7	1736.4	385.8	25.3	1042.0	101.6
380	PYRAMID	21	11701185	A	9	84	323.9	25.9	11.2	39.9	31.5	26.3	308.3	70.0	2.0	167.1	11.3
381	QUEENSCLIFF	38	14401455	P	19	200	0.0	14.1	5.8	24.3	11.8	18.4	747.7	76.6	41.0	213.8	145.8
382	QUEENSTOWN	42	14451465	P	25	660	15.1	11.6	3.8	21.3	8.1	15.3	1592.5	181.4	81.4	514.4	265.5
383	QUILPIE	26	14401455	A	6	35	254.6	21.6	4.7	36.7	25.9	13.5	302.8	46.2	12.1	129.7	43.3
384	QUOBBA	24	11251140	R	3	24	0.0	22.6	11.1	34.6	18.7	23.6	306.1	60.7	2.5	159.5	12.2
385	RANKEN	19	13651380	A	6	16	255.9	25.1	9.4	38.0	29.7	20.0	356.9	73.0	5.1	200.8	19.8
386	RASON	28	12301245	I	4	7	475.8	20.3	5.1	36.2	26.9	16.9	183.8	26.9	6.7	71.2	25.5
387	RAVENSTHORPE	33	12001215	K	56	1290	195.1	16.1	5.3	29.2	11.2	22.2	411.9	48.0	19.0	134.7	60.5
388	RAWLINSON	24	12751290	A	8	46	497.6	23.0	6.0	38.1	29.2	16.6	208.6	43.7	3.0	107.0	15.6
389	RED RIVER	17	14251440	C	11	23	182.9	25.9	13.4	37.2	28.1	22.8	975.9	237.6	4.9	659.9	21.3
390	RENMARK	34	13951410	I	16	301	55.9	16.5	4.4	32.0	10.6	22.3	352.5	38.8	17.0	110.4	59.0
391	RICHMOND	20	14251440	A	6	4	252.0	24.8	9.4	37.4	28.7	20.2	571.2	136.4	5.3	362.4	22.8
392	ROBERTSON	23	12001215	A	5	15	575.5	23.8	7.4	39.1	30.4	20.6	273.3	58.2	4.7	140.6	21.9
393	ROBINSON RANGE	25	11701185	A	1	2	486.0	23.0	7.2	39.1	15.8	22.8	256.6	46.0	7.2	105.3	24.2
394	ROBINSON RIVER	16	13651380	E	3	10	73.7	26.5	14.1	36.5	29.4	22.8	790.3	192.9	2.0	541.7	8.3
395	ROCKHAMPTON	23	15001515	D	29	413	3.6	22.1	10.1	31.0	26.1	20.1	974.0	179.4	25.2	461.8	101.9
396	RODINGA	24	13351350	A	11	45	407.3	22.0	4.4	38.5	28.7	15.5	189.6	27.0	2.5	73.3	23.2
397	ROEBOURNE	20	11701185	A	9	48	0.0	26.4	13.9	36.7	30.9	23.9	344.1	86.3	–0.5	202.8	3.2
398	ROMA	26	14851500	D	20	81	348.2	20.3	4.0	33.5	25.5	14.4	676.5	84.2	31.0	246.1	107.7
399	ROPER RIVER	14	13501365	C	7	21	0.0	27.0	15.4	36.4	29.2	24.0	1043.7	229.9	2.1	654.8	12.1
400	ROTTNEST	31	11401155	S	1	189	0.0	18.3	10.2	29.0	14.6	23.9	788.5	178.4	5.5	458.8	23.3
401	ROY HILL	22	11851200	A	11	24	420.9	25.3	9.6	40.3	31.3	26.0	280.3	65.6	1.5	157.8	11.9
402	RUDALL	22	12151230	F	3	37	375.8	25.3	8.3	40.2	31.0	22.7	276.4	78.6	–2.3	190.6	–0.6
403	RUTLAND PLAINS	15	14101425	A	7	26	13.2	27.5	17.3	36.6	28.6	25.5	1187.9	292.1	6.3	819.3	20.2
404	SAHARA	21	12301245	A	4	3	280.8	26.0	8.8	40.2	31.0	20.4	331.7	99.0	–3.1	243.5	–4.2
405	SALE	38	14701485	Q	9	38	0.0	14.2	4.6	24.7	15.3	18.6	783.2	77.8	55.1	215.2	168.3
406	SANDOVER RIVER	21	13651380	A	6	10	240.7	24.4	7.1	39.1	30.3	18.3	253.0	47.7	4.9	129.4	17.9
407	SANDSTONE	27	11851200	G	8	57	538.8	21.3	5.7	37.6	14.0	21.2	243.2	39.6	8.4	92.8	28.9
408	SCOTT	25	12751290	A	10	31	558.0	22.0	5.5	37.4	26.0	15.5	204.4	35.0	6.5	85.8	27.2
409	SHARK BAY	25	11251140	R	3	13	12.8	21.9	10.1	34.7	17.8	23.0	301.5	63.2	0.0	169.0	11.7
410	SIMPSON DESERT SOUTH	25	13651380	A	1	1	83.4	23.2	6.2	39.4	30.0	16.5	184.0	41.1	0.5	108.7	5.8
411	SINGLETON	32	15001515	O	93	1633	138.3	17.3	3.0	30.7	23.4	12.3	880.2	115.6	44.5	303.0	150.8
412	SIR SAMUEL	27	12001215	G	7	33	508.1	21.5	5.7	37.7	28.7	21.7	199.3	30.1	4.7	80.8	20.0
413	SOUTH LAKE WOODS	18	13201335	A	8	83	234.0	26.5	10.5	38.7	30.4	22.0	503.2	115.2	2.1	390.0	8.9
414	SOUTHERN CROSS	31	11851200	K	38	177	403.8	17.6	4.7	33.4	11.9	20.4	285.6	35.7	12.7	100.8	41.2
415	SPRINGSURE	24	14701485	D	41	302	423.1	20.9	5.0	33.8	26.4	15.4	651.0	98.6	24.7	260.4	86.1
416	SPRINGVALE	23	13951410	A	2	0	141.4	24.1	6.9	39.2	30.3	17.7	270.5	66.0	2.4	164.9	11.6
417	ST ARNAUD	36	14251440	P	22	144	176.2	14.7	2.9	30.9	11.4	20.4	449.2	47.3	29.0	131.9	92.3
418	ST GEORGE	28	14851500	D	17	57	200.7	19.7	3.0	34.3	23.1	15.9	465.5	64.4	20.4	172.9	72.0

APPENDIX 1

Map #	Map name	Lat S	Long W-E	Group code	# TX	# Herb SPS	Elevation	TEMP. MEAN	TEMP. MIN.	TEMP. MAX.	TEMP. WETQ	TEMP. DRYQ	RAIN MEAN	RAIN MAX.	RAIN MIN.	RAIN WETQ	RAIN DRYQ
419	ST LAWRENCE	22	14851500	D	23	114	180.7	22.2	9.5	32.0	26.1	18.0	829.7	158.5	18.0	421.5	74.1
420	STANLEY	25	12151230	F	3	9	516.5	22.9	6.3	38.7	29.6	19.5	203.2	43.9	1.8	108.1	12.4
421	STREAKY BAY	32	13351350	I	10	98	6.9	17.5	6.3	30.0	12.3	21.8	305.5	44.3	8.0	127.5	36.8
422	SURAT	27	14851500	D	13	63	304.9	20.0	3.4	33.9	23.3	16.2	560.8	72.2	28.9	204.6	95.4
423	SWAN HILL	35	14251440	I	11	86	76.2	16.1	3.5	32.3	12.8	18.6	330.2	31.5	22.5	91.2	74.2
424	SYDNEY	33	15001515	O	96	4299	97.7	16.9	3.5	28.7	21.9	12.2	923.9	105.4	49.6	297.9	159.9
425	TABLETOP	22	12301245	F	1	1	283.1	25.6	8.4	40.3	31.0	19.7	275.0	83.4	–4.1	204.2	–7.6
426	TALBOT	26	12601275	A	14	50	482.3	21.7	5.6	37.2	28.0	15.2	178.9	33.1	4.4	80.9	19.1
427	TALLANGATTA	36	14701485	O	35	578	798.5	11.4	–0.2	25.2	5.3	17.3	1065.2	115.7	63.9	324.5	193.7
428	TALLARINGA	29	13201335	I	6	23	186.4	19.5	5.5	34.1	13.5	22.1	172.8	24.8	10.2	61.3	33.8
429	TAMBO	24	14551470	D	20	48	474.1	21.0	4.9	34.6	23.4	15.4	502.7	76.2	19.8	207.1	69.3
430	TAMWORTH	31	15001515	O	46	824	526.9	15.3	0.2	29.5	22.5	9.5	742.1	95.6	44.7	261.7	143.1
431	TANAMI	19	12901305	A	8	47	434.2	25.5	8.2	38.7	30.0	20.3	415.5	48.6	3.3	252.6	12.4
432	TANAMI EAST	19	13051320	E	2	2	286.0	26.1	9.4	39.0	30.4	21.3	412.2	97.1	1.8	251.6	7.4
433	TANGORIN	21	14401455	B	3	26	318.3	23.6	7.9	36.2	27.9	18.9	519.2	114.0	8.0	305.5	30.4
434	TANUMBIRINI	16	13351350	C	11	24	287.9	26.2	11.5	37.7	29.4	22.4	691.5	153.6	3.0	429.4	12.4
435	TARCOOLA	30	13351350	I	7	18	148.5	19.1	5.7	34.0	12.3	21.7	205.4	29.1	10.0	77.9	35.2
436	TAROOM	25	14851500	D	35	177	322.0	20.5	4.4	33.3	26.1	15.0	713.5	97.0	29.4	275.8	101.9
437	TENNANT CREEK	19	13351350	A	13	121	340.2	25.9	10.8	38.6	30.3	21.0	388.8	82.0	4.1	222.5	14.7
438	THARGOMINDAH	27	14251440	A	3	10	165.3	21.6	5.0	37.5	27.4	13.3	225.4	41.0	7.2	106.8	26.5
439	THE GRANITES	20	12901305	A	11	84	352.8	25.6	8.1	39.2	30.3	20.2	350.1	85.5	1.1	216.4	6.9
440	THROSSELL	27	12301245	I	2	20	464.3	21.3	5.5	37.2	27.9	18.0	171.8	32.0	3.1	81.9	15.1
441	TICKALARA	28	14101425	A	2	4	113.3	21.4	5.3	37.8	27.4	14.6	184.6	35.0	5.2	89.5	18.8
442	TOBERMOREY	22	13651380	A	4	7	215.7	24.0	6.4	39.5	30.4	17.6	227.3	44.3	3.5	118.9	14.4
443	TOOMPINE	27	14401455	A	5	47	225.9	21.2	4.4	36.6	25.3	12.9	278.5	40.3	12.4	112.1	43.1
444	TORRENS	31	13651380	I	1	6	82.4	18.9	5.5	34.4	12.8	21.8	242.2	28.6	14.2	80.7	45.2
445	TORRES STRAIT	10	14181433	C	11	0	0.0	26.6	21.0	32.2	27.4	25.8	1797.1	397.0	3.1	1161.2	20.6
446	TOWNSVILLE	19	14551470	D	31	146	355.4	23.6	10.1	34.7	26.6	20.0	964.9	210.6	12.5	588.2	48.0
447	TRUANT ISLAND	11	13651380	C	6	0	0.0	26.7	19.4	32.5	28.0	25.8	1323.6	280.9	2.0	785.9	8.6
448	TUREE CREEK	23	11701185	T	1	3	326.5	25.2	9.7	41.0	31.6	25.4	234.1	46.6	1.2	115.4	8.4
449	TWEED HEADS	28	15301545	O	44	276	0.0	19.9	9.0	28.2	23.7	17.9	1762.5	252.3	62.5	687.9	247.4
450	ULLADULLA	35	15001515	O	69	1020	0.0	16.6	7.8	24.4	20.4	13.1	1116.5	127.9	57.0	368.5	192.6
451	URANDANGI	21	13801395	A	7	51	221.4	24.7	7.7	39.0	30.5	18.6	274.1	57.8	4.4	151.1	17.8
452	URAPUNGA	14	13351350	C	14	25	45.8	27.2	14.3	37.6	29.2	24.4	1060.8	241.2	1.6	668.7	11.9
453	URISINO	29	14251440	A	4	3	112.5	20.6	4.9	36.3	26.4	14.0	216.3	33.1	9.5	87.5	31.5
454	VICTORIA RIVER DOWNS	16	13051320	C	16	68	131.0	27.1	11.2	38.7	30.0	23.6	726.4	171.9	0.7	459.0	7.4
455	WAGGA WAGGA	35	14701485	O	36	1198	368.8	13.9	0.7	30.9	7.0	20.9	805.5	84.1	51.1	233.8	163.0
456	WALGETT	30	14701485	A	4	103	133.9	19.1	3.0	34.5	25.3	15.1	411.4	50.6	25.7	131.1	83.8
457	WALLHALLOW	17	13501365	E	5	21	262.2	26.0	11.4	37.7	29.6	21.8	568.7	127.6	3.3	356.1	12.7
458	WALSH	16	14251440	C	8	17	104.0	26.4	15.5	36.2	28.1	23.8	1138.4	277.6	6.2	779.4	22.1
459	WANGARATTA	36	14551470	O	37	380	198.5	14.5	2.3	30.2	8.0	20.4	679.6	72.1	41.5	210.7	129.8
460	WANNA	28	12751290	G	1	4	324.4	20.1	5.1	35.0	25.9	17.2	157.5	20.9	6.6	53.7	25.4
461	WARBURTON	37	14551470	O	45	227	887.1	10.5	1.4	23.3	5.6	16.2	1315.4	140.6	74.0	389.6	236.0
462	WARRAGUL	38	14551470	O	29	273	236.0	12.6	3.3	24.9	8.7	17.2	1106.3	122.5	56.5	333.3	192.1
463	WARRI	24	12451260	Y	1	0	440.8	23.6	6.6	38.8	29.7	17.2	205.0	53.2	–0.6	129.3	3.0
464	WARRINA	28	13501365	A	1	6	123.4	21.1	5.9	37.3	28.1	21.5	152.7	22.3	5.1	59.7	21.9
465	WARWICK	28	15151530	O	85	797	497.8	17.0	3.6	28.4	23.3	14.5	857.1	143.8	36.9	359.0	121.8
466	WATERLOO	16	12901305	C	11	73	115.7	27.6	11.7	39.0	30.3	24.1	654.6	160.2	0.4	406.9	6.4
467	WAVE HILL	17	13051320	A	6	8	189.7	26.9	10.6	39.0	30.3	22.9	596.4	141.6	1.1	372.6	7.2
468	WEBB	22	12751290	A	1	0	372.7	24.7	7.2	39.1	30.1	18.8	259.5	66.7	–0.6	165.2	2.8
469	WEIPA	12	14101425	C	10	40	0.0	26.5	19.1	33.5	27.5	25.7	1546.0	340.3	5.3	1000.1	24.5

470	WELLS	28	13051320	I	7	43	326.0	19.7	4.7	35.0	13.3	20.2	165.1	22.4	9.4	53.7	32.4
471	WESSELL ISLANDS	11	13501365	C	4	32	0.0	27.0	19.2	33.2	28.2	25.0	1347.7	281.5	1.3	808.5	11.7
472	WESTMORELAND	17	13801395	C	14	82	42.7	27.0	15.1	35.9	29.7	23.4	764.7	207.2	2.2	562.7	7.6
473	WESTWOOD	27	12451260	V	1	0	426.2	21.3	5.6	36.8	27.6	14.8	164.4	30.9	3.3	77.9	14.6
474	WHITE CLIFFS	30	14251440	A	4	12	149.7	19.8	4.7	35.2	23.3	13.3	221.4	26.6	13.2	74.4	40.4
475	WHYALLA	33	13651380	I	16	154	10.6	17.5	6.8	30.1	12.1	19.4	355.3	45.5	17.3	133.4	55.9
476	WIDE BAY	25	15301545	O	12	34	0.0	21.4	13.0	27.6	24.4	19.5	1752.7	275.7	55.1	740.7	216.3
477	WIDGIEMOOLTHA	31	12151230	K	33	48	299.4	18.0	5.3	32.9	18.5	20.6	241.3	26.8	15.0	77.3	46.5
478	WILCANNIA	31	14251440	I	7	40	84.2	19.3	4.7	34.7	26.2	13.1	234.8	27.1	13.3	77.8	42.6
479	WILSON	22	12601275	H	1	5	406.4	24.8	7.3	39.2	30.2	18.8	269.2	72.1	–0.6	177.0	2.5
480	WILUNA	26	12001215	G	12	101	558.4	22.0	5.8	38.2	29.3	22.4	217.8	34.3	5.9	87.8	23.1
481	WINDORAH	25	14251440	A	3	14	163.5	22.7	5.7	37.9	28.0	14.6	276.5	60.0	5.7	153.0	23.1
482	WINNECKE CREEK	18	13051320	A	2	2	275.7	26.4	9.9	38.8	30.3	21.9	491.1	115.7	2.1	302.1	8.4
483	WINNING POOL	23	11401155	A	5	10	131.4	24.8	11.0	40.3	19.0	24.3	264.8	50.2	3.3	122.6	10.6
484	WINTINNA	27	13351350	A	3	17	295.7	20.9	4.9	37.4	27.9	21.5	148.1	17.6	5.0	47.8	23.7
485	WINTON	22	14251440	A	3	9	219.5	24.0	7.6	37.5	25.0	18.5	401.0	96.2	5.3	245.5	21.5
486	WOLLONGONG	34	15001515	O	84	2065	55.1	16.8	6.2	25.7	21.1	12.8	1085.3	136.2	47.7	382.4	165.1
487	WOODROFFE	26	13051320	A	9	50	600.7	20.0	3.3	36.4	12.5	21.0	210.3	22.0	12.1	59.6	45.6
488	WOORAMEL	25	11401155	A	6	26	134.4	22.8	9.2	38.1	17.3	25.1	247.7	52.4	1.4	133.8	10.1
489	WYANDRA	27	14551470	A	9	30	221.9	21.0	4.2	35.9	27.0	12.9	353.0	46.8	17.1	132.4	59.3
490	WYLOO	22	11551170	G	4	1	206.8	25.9	11.3	41.0	32.0	25.9	264.5	48.5	1.8	120.4	8.5
491	WYOLA	29	12901305	I	9	107	200.7	19.1	5.3	33.0	13.7	19.4	165.1	24.9	9.6	54.2	30.5
492	YALGOD	28	11551170	K	18	26	344.8	20.4	6.7	36.6	13.2	23.5	349.7	78.7	7.7	184.5	30.6
493	YAMPI	16	12301245	C	12	38	0.0	28.1	18.2	34.7	29.5	27.3	850.6	244.5	1.5	633.2	6.0
494	YANREY	22	11401155	A	9	86	24.0	25.1	12.6	38.0	30.7	24.5	293.2	49.9	2.0	126.1	7.6
495	YANTABULLA	29	14401455	A	6	58	111.8	20.4	4.3	35.9	23.9	13.8	263.6	37.8	13.1	99.6	43.3
496	YARDEA	32	13501365	I	11	238	238.0	17.2	5.3	32.4	10.9	23.2	349.8	47.8	13.8	141.0	45.1
497	YARINGA	26	11401155	R	11	116	159.1	21.9	8.5	37.2	16.5	24.0	284.5	64.1	1.3	161.4	14.7
498	YARRALOOLA	21	11551170	A	8	17	144.4	26.1	12.5	38.9	31.5	26.0	294.0	60.2	1.6	144.2	8.3
499	YARRIE	20	12001215	A	3	4	207.4	26.6	10.5	39.9	31.4	24.4	382.4	110.4	–2.3	268.9	–2.3
500	YOUANMI	28	11851200	G	10	29	439.7	20.9	5.8	37.1	13.9	20.6	212.9	32.4	4.8	76.5	19.7
501	YOWALGA	26	12451260	G	2	6	451.6	22.0	5.8	37.6	28.4	15.5	171.9	36.6	1.9	90.4	10.7
502	ZANTHUS	31	12301245	K	17	111	195.1	18.2	5.8	32.3	18.8	20.0	244.0	26.8	14.8	75.2	47.0

Appendix 2

Names of taxa used in the analysis together with their Pryor and Johnson codes, number of mapsheet districts in which the taxon occurs and the taxon group to which it was assigned.

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
1	ABBREVIATA	CAA:C	7	a
2	ABERGIANA	CAFIL	4	d
3	ACACIIFORMIS	SPECC	4	l
4	ACCEDENS	SII:C	6	g
5	ACIES	MABEJ	1	j
6	ACMENOIDES	MAG:C	35	m
7	AFF PELTATA SUBSP LEICHHARDTII	CCA:B	4	d
8	AFF TERMINALIS SANDHILL BLOODWOOD	CAFEN	4	a
9	AFF LAEVOPINEA (QLD)	MAHABB	2	d
10	AFF TECTIFICA	SUADB	2	a
11	AGGLOMERATA	MAHCG	12	q
12	AGGREGATA	SPEAG	6	r
13	ALBA	SNABAA	48	a
14	ALBENS	SUL:G	28	q
15	ALBIDA	SIZ:G	6	h
16	ALPINA	MAHCC	1	b
17	AMPLIFOLIA	SNEEA	13	u
18	AMYGDALINA	MATEH	9	c
19	ANCEPS	SLE:IB	22	h
20	ANDREWSII SUBSP ANDREWSII	MATHDA	11	l
21	ANDREWSII SUBSP CAMPANULATA	MATHDB	8	l
22	ANGOPHOROIDES	SPIDB	8	r
23	ANGULOSA VAR ANGULOSA	SLOAC	15	h
24	ANGULOSA VAR CERATOCORYS	SLOABC	1	i
25	ANGUSTISSIMA	SIP:M	3	j
26	ANNULATA	SIDAK	9	h
27	APICULATA	MAKIH	3	w
28	APICULATA SUBSP UPPER CUDGEGONG	MAKIHB	2	w
29	APODOPHYLLA	SNADE	9	a
30	APPROXIMANS SUBSP APPROXIMANS	MAKIKA	4	l
31	APPROXIMANS SUBSP CODONOCARPA	MAKIKC	3	l
32	AQUILINA	MABCC	1	j
33	ARCHERI	SPINIB	2	c
34	ARGILLACEA	SUADC	41	a
35	ARGILLACEA (KIMBERLEY)	SUADCB	3	a
36	ARGOPHLOIA	SUNAA	1	e
37	AROMAPHLOIA	SPECA	12	q
38	ASPERA	BAA:I	31	a
39	ASTRINGENS	SIDAB	9	h
40	BAA:J	BAA:J	13	a
41	BADJENSIS	SPIKN	1	s
42	BAEUERLENII	SPIKO	2	r
43	BAILEYANA	EFABA	12	m
44	BAKERI	SIR:E	11	d
45	BALLADONIENSIS	SIT:Z	2	i
46	BANCROFTII	SNECE	14	l
47	BANKSII	SPIFA	7	l
48	BARBERI	SPEAF	2	c
49	BAUERANA	SUT:C	9	q
50	BAXTERI	MAHCAA	18	t
51	BEARDIANA	SIVAB	2	g
52	BEHRIANA	SUDGA	17	b
53	BENNETTIAE	SICBG	1	j
54	BENTHAMII	NB	7	u
55	BEYERI	SUV:EA	5	w
56	BIGALERITA	SNABE	23	a
57	BLAKELYI VAR BLAKELYI	SNEEFA	23	q
58	BLAKELYI VAR IRRORATA	SNEEFB	6	t
59	BLAXLANDII	MAHCD	8	w
60	BLEESERI	CAFEC	16	a
61	BLOXSOMEI	CCA:C	10	d
62	BOSISTOANA	SUNCA	8	r
63	BOTRYOIDES	SECAD	8	r
64	BRACHYANDRA	SBA:D	9	a
65	BRACHYCALYX	SLI:B	16	b
66	BRACHYCORYS	SLUAK	9	h
67	BRACHYPHYLLA	SIM:B	4	i
68	BRASSIANA	SNEET	10	a
69	BREVIFOLIA	SNABGA	20	a
70	BREVISTYLIS	MAE:A	1	g

APPENDIX 2

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
71	BRIDGESIANA	SPIDCA	25	q
72	BROCKWAYI	SIS:C	1	i
73	BROOKERANA	SPIJF	6	c
74	BROWNII	SUDEAB	17	d
75	BUPRESTIUM	MADAA	2	j
76	BURDETTIANA	SICBC	3	j
77	BURGESSIANA	MAKIF	1	x
78	BURRACOPPINENSIS	SIVEJ	7	h
79	CAESIA	SIVCG	7	h
80	CAFIE	CAFIE	4	d
81	CALCAREANA	SLE:GC	6	a
82	CALCICOLA	MABEN	2	j
83	CALEYI	SUV:K	10	l
84	CALIGINOSA	MAHED	6	l
85	CALOPHYLLA	CAFUA	10	g
86	CALYCOGONA	SIX:D	39	h
87	CAMALDULENSIS	SNEEPA	245	a
88	CAMBAGEANA	SUG:A	15	d
89	CAMERONII	MAHEH	6	l
90	CAMFIELDII	MAHCE	2	x
91	CAMPASPE	SIK:C	5	i
92	CAMPHORA	SPEAA	15	q
93	CANALICULATA	SECEDC	2	v
94	CAPITELLATA	MAHCF	5	w
95	CARNEI	SIJ:D	7	a
96	CELASTROIDES	SIX:F	21	h
97	CEPHALOCARPA	SPINUC	7	t
98	CERASIFORMIS	SIF:G	1	i
99	CHAPMANIANA	SPING	4	t
100	CINEREA	SPINUA	7	q
101	CINEREA (BEECHWORTH)	SPINUB	2	t
102	CINEREA (EAST GIPPSLAND)	SPINUD	2	t
103	CITRIODORA	CCC:A	20	d
104	CLADOCALYX	SIS:A	10	b
105	CLAVIGERA	BAA:F	19	a
106	CLELANDII	SLE:M	17	h
107	CLIFTONIANA	CAFIJ	15	a
108	CLOEZIANA	IAA:A	20	d
109	CNEORIFOLIA	SIP:K	2	b
110	COCCIFERA	MATES	6	c
111	COLLINA	CAFEA	4	a
112	COMITAEVALLIS	SLI:G	11	i
113	CONCINNA	SLI:I	34	a
114	CONFERRUMINATA	SICBF	3	j
115	CONFERTIFLORA	BAA:E	55	a
116	CONFLUENS	SNABGB	4	a
117	CONGLOBATA	SLE:IA	15	h
118	CONGLOMERATA	MAHEJ	1	f
119	CONICA	SUT:B	23	o
120	CONSIDENIANA	MAKEA	12	r
121	COOPERANA	SIT:S	5	h
122	CORDATA	SPINO	5	c
123	CORNUTA	SICBA	9	j
124	CORONATA	MAA:C	3	j
125	CORRUGATA	SLI:K	5	h
126	COSMOPHYLLA	SECGB	3	b
127	CREBRA	SUP:S	59	m
128	CRENULATA	SPICA	2	t
129	CRUCIS	SIVCE	4	h
130	CULLENII	SUP:K	13	d
131	CUPULARIS	SNAFB	2	a
132	CURTISII	GAA:A	6	d
133	CYANOCLADA	SUADJ	7	a
134	CYANOPHYLLA	SLE:H	5	a
135	CYLINDRIFLORA	SIF:A	11	h
136	CYLINDROCARPA	SLUAD	12	h
137	CYPELLOCARPA	SPIFE	23	q
138	DALRYMPLEANA SUBSP DALRYMPLEANA	SPINCA	19	r
139	DALRYMPLEANA SUBSP HEPTANTHA	SPINCC	8	l
140	DAWSONII	SUT:E	4	w
141	DEALBATA VAR DEALBATA	SNEEJ	31	o
142	DEALBATA VAR CHLOROCLADA	SNEEH	17	o
143	DEANEI	SECAA	7	u

APPENDIX 2

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
144	DECIPIENS	SIP:G	13	h
145	DECORTICANS	SUP:D	13	d
146	DECURVA	SIP:B	8	j
147	DEFLEXA	SLI:H	4	h
148	DEFORMIS	MAHELB	2	x
149	DELEGATENSIS	MAKBE	13	t
150	DENDROMORPHA	MAKID	4	r
151	DESMONDENSIS	SIGCA	1	j
152	DICHROMOPHLOIA	CAFEGA	125	a
153	DIELSII	SIF:F	5	h
154	DIPTERA	SIK:F	8	h
155	DISCRETA	SIZ:F	1	k
156	DISTANS	SUADM	1	a
157	DIVERSICOLOR	SEB:A	6	g
158	DIVERSIFOLIA	MABAC	19	b
159	DIVES	MATEP	20	q
160	DONGARRAENSIS	SLE:D	12	g
161	DORATOXYLON	SIP:A	7	j
162	DREPANOPHYLLA	SUP:F	43	d
163	DRUMMONDII	SIVEC	10	g
164	DUMOSA	SLE:GA	40	b
165	DUNDASII	SLUBA	4	i
166	DUNNII	SPIDA	5	l
167	DWYERI	SNEEL	17	o
168	EBBANOENSIS	EAABJ	8	g
169	EFFUSA	SIK:I	2	i
170	ELATA	MATEN	11	r
171	EREMICOLA	SIT:R	11	a
172	EREMOPHILA	SIDCH	23	h
173	ERYTHROCORYS	EAAAC	4	g
174	ERYTHRONEMA VAR ERYTHRONEMA	SIF:CA	6	h
175	ERYTHRONEMA VAR MARGINATA	SIF:CB	3	g
176	ERYTHROPHLOIA	CAFEGE	27	d
177	EUDESMIOIDES	EAAAE	12	g
178	EUGENIOIDES	MAHEA	29	n
179	EWARTIANA	SIVCA	16	g
180	EXILIS	MADAF	3	g
181	EXIMIA	CCA:E	4	w
182	EXSERTA	SNEEX	49	d
183	FALCATA	SIP:E	16	h
184	FASCICULOSA	SUT:F	9	b
185	FASTIGATA	MAKCB	14	q
186	FERRUGINEA	CAA:B	35	a
187	FIBROSA SUBSP FIBROSA	SUP:AA	28	n
188	FIBROSA SUBSP NUBILA	SUP:AB	11	o
189	FICIFOLIA	CAFOA	4	g
190	FITZGERALDII	SUABF	1	a
191	FLINDERSII	SNEEK	3	a
192	FLOCKTONIAE	SIT:T	21	h
193	FOECUNDA	SIZ:B	67	h
194	FOELSCHEANA	CAFEE	26	a
195	FORMANII	SIZ:D	3	i
196	FORRESTIANA SUBSP DOLICHORHYNCHA	SLOBEB	3	h
197	FORRESTIANA SUBSP FORRESTIANA	SLOBEA	2	j
198	FRASERI	SLE:J	4	h
199	FRAXINOIDES	MAKIB	4	r
200	FROGGATTII	SUNEF	3	b
201	FRUTICOSA	SIZ:C	3	a
202	GAMOPHYLLA	EAADE	46	a
203	GARDNERI	SIGAJ	13	h
204	GEORGEI	SLE:B	1	i
205	GILBERTENSIS	BAA:H	8	d
206	GILLENII	SNEEM	5	a
207	GILLII	SIT:N	8	a
208	GITTINSII	EAAAG	4	g
209	GLAUCESCENS	SPINH	6	t
210	GLAUCINA	SNEEC	4	v
211	GLOBOIDEA	MAHEF	20	q
212	GLOBULUS SUBSP BICOSTATA	SPIFK	18	q
213	GLOBULUS SUBSP GLOBULUS	SPIFL	14	c
214	GLOBULUS SUBSP MAIDENII	SPIFI	5	r
215	GLOBULUS SUBSP PSEUDOGLOBULUS	SPIFJ	3	t
216	GOMPHOCEPHALA	SICAA	5	g

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
217	GONGYLOCARPA	EAADA	22	a
218	GONIANTHA SUBSP GONIANTHA	SIP:DA	6	h
219	GONIANTHA SUBSP SEMIGLOBOSA	SIP:DB	1	j
220	GONIOCALYX	SPIFB	29	q
221	GRACILIS	SIX:A	67	h
222	GRANDIFOLIA	BAA:D	34	a
223	GRANDIS	SECAB	18	m
224	GREGSONIANA	MAKHF	3	r
225	GRIFFITHSII	SLI:J	8	i
226	GROSSA	SIJ:A	7	h
227	GUILFOYLEI	SDA:A	3	g
228	GUMMIFERA	CAFUF	19	n
229	GUNNII	SPINI	6	c
230	HAEMASTOMA	MATKA	5	r
231	HAEMATOXYLON	CAFUD	3	g
232	HALLII	SNAGA	2	d
233	HENRYI	CCC:C	6	l
234	HERBERTIANA	SNAFA	10	a
235	HOUSEANA	SNADD	5	a
236	HOWITTIANA	SSA:A	2	d
237	IMLAYENSIS	SPIJC	1	t
238	INCRASSATA	SLOAB	47	h
239	INSULARIS	MADEM	1	j
240	INTERMEDIA	CAFID	32	m
241	INTERTEXTA	SUH:A	54	a
242	JACKSONII	MAF:A	2	j
243	JACOBSIANA	CAJ:A	8	a
244	JENSENII	SUP:U	21	a
245	JOHNSONIANA	MADEJ	1	g
246	JOHNSTONII	SPIJAC	4	c
247	JUCUNDA	EAACM	6	g
248	JUTSONII	SIR:AA	2	i
249	KARTZOFFIANA	SPINB	1	s
250	KINGSMILLII	SIVEQ	19	a
251	KITSONIANA	SPIAC	6	t
252	KOCHII	SIT:E	3	g
253	KOMBOLGIENSIS	BAA:G	4	a
254	KONDININENSIS	SLE:K	3	h
255	KOOLPINENSIS	SUABG	3	a
256	KRUSEANA	SIM:A	5	i
257	KYBEANENSIS	MAKKA	4	t
258	LAELIAE	SII:A	3	g
259	LAEVOPINEA	MAHAB	12	l
260	LANEPOOLEI	SIVEA	2	g
261	LANSDOWNEANA SUBSP ALBOPURPUREA	SUNEAB	3	b
262	LANSDOWNEANA SUBSP LANSDOWNEANA	SUNEAA	2	a
263	LARGEANA	SUDAA	4	v
264	LARGIFLORENS	SUDEC	55	a
265	LATIFOLIA	CAFEF	25	a
266	LEHMANNII	SICBE	8	j
267	LEPTOCALYX	SLI:F	11	h
268	LEPTOPHLEBA	SUABB	22	d
269	LEPTOPODA	SIVAA	20	h
270	LESOUEFII	SLE:N	12	i
271	LEUCOPHLOIA	SNACIB	40	a
272	LEUCOXYLON SUBSP LEUCOXYLON	SUX:CA	17	b
273	LEUCOXYLON SUBSP MEGALOCARPA	SUX:CB	4	b
274	LEUCOXYLON SUBSP PETIOLARIS	SUX:CE	3	b
275	LEUCOXYLON SUBSP PRUINOSA	SUX:CC	11	b
276	LIGULATA	MABEL	2	j
277	LIGUSTRINA	MAHEQ	4	x
278	LIRATA	EFAAB	4	a
279	LONGICORNIS	SIT:A	24	h
280	LONGIFOLIA	SECGA	8	r
281	LOXOPHLEBA SUBSP GRATIAE	SIN:AC	4	h
282	LOXOPHLEBA SUBSP LOXOPHLEBA	SIN:AA	36	h
283	LUCASII	SUDAD	13	a
284	LUCENS	SUT:H	5	a
285	LUEHMANNIANA	MAKDB	3	x
286	MABIR	MABIR	4	i
287	MACARTHURII	SPIKC	2	x
288	MACRANDRA	SIDAJ	3	j
289	MACROCARPA	SIVEE	10	g

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
290	MACROCERA	NM	3	j
291	MACRORHYNCHA SUBSP CANNONII	MAHACB	4	w
292	MACRORHYNCHA SUBSP MACRORHYNCHA	MAHACA	34	q
293	MACULATA	CCC:B	28	n
294	MAG:AC	MAG:AC	7	d
295	MAGIF	MAGIF	1	d
296	MAHECB	MAHECB	1	d
297	MAHEG	MAHEG	2	r
298	MAHEI	MAHEI	1	y
299	MAHEK	MAHEK	2	u
300	MAHEM	MAHEM	2	l
301	MAHEO	MAHEO	5	u
302	MAJOR	SECEB	12	d
303	MAKDE	MAKDE	2	x
304	MALACOXYLON	SPIDCB	2	p
305	MANNENSIS	SIR:AC	22	a
306	MANNIFERA SUBSP ELLIPTICA	SPECHC	5	l
307	MANNIFERA SUBSP GULLICKII	SPECHE	5	r
308	MANNIFERA SUBSP MACULOSA	SPECHD	17	q
309	MANNIFERA SUBSP MANNIFERA	SPECHA	18	q
310	MANNIFERA SUBSP PRAECOX	SPECHB	5	u
311	MARGINATA	MADCA	12	g
312	McKIEANA	MAHER	3	p
313	MEGACARPA	MAA:A	8	g
314	MEGACORNUTA	SICBD	1	j
315	MELANOLEUCA	SUV:C	6	d
316	MELANOPHLOIA	SUP:V	52	d
317	MELANOXYLON	SLI:C	11	h
318	MELLIODORA	SUX:A	51	q
319	MERRICKIAE	SLI:DA	11	h
320	MICHAELIANA	SNI:A	5	u
321	MICRANTHERA	SIP:I	5	j
322	MICROCARPA	SUL:DB	43	o
323	MICROCORYS	SWA:A	15	n
324	MICRONEURA	SUADE	10	d
325	MICROTHECA	SUADFA	176	a
326	MINIATA	EFC:A	53	a
327	MITCHELLIANA	MAKLA	1	t
328	MOLUCCANA	SUL:B	16	l
329	MOOREANA	SNADA	3	a
330	MOOREI VAR MOOREI	MAKMC	7	r
331	MOOREI VAR LATIUSCULA	MAKMB	3	r
332	MORRISBYI	SPINK	3	c
333	MORRISII	SNEEZ	11	a
334	MUELLERANA	MAHAA	11	r
335	MULTICAULIS	MAKEE	6	w
336	MYRIADENA	SLUAC	9	h
337	NABARLEKENSIS	NN	2	a
338	NEGLECTA	SPIAA	4	t
339	NESOPHILA	CAFUL	19	a
340	NEWBEYI	SICBH	1	j
341	NICHOLII	SPECE	6	l
342	NIGRA	MAHEB	3	l
343	NITENS	SPIFG	9	q
344	NITIDA	MATEJ	17	c
345	NORMANTONENSIS	SUDAB	38	a
346	NORTONII	SPIFC	17	q
347	NOTABILIS	SECCB	7	u
348	NOVAANGLICA	SPINS	5	l
349	NUTANS	SIDCA	4	j
350	OBLIQUA	MAKAA	41	q
351	OBLONGA	MAHELA	11	q
352	OBTUSIFLORA	MAKIE	4	w
353	OCCIDENTALIS	SIDAA	13	h
354	OCHROPHLOIA	SUJ:B	15	a
355	ODONTOCARPA	EAADC	23	a
356	ODORATA VAR ANGUSTIFOLIA	SUNEBB	7	b
357	ODORATA VAR ODORATA	SUNEBA	14	b
358	OLDFIELDII	SIVEH	17	g
359	OLEOSA VAR BOREALIS	SIT:Q	4	a
360	OLEOSA VAR OLEOSA	SIT:C	72	h
361	OLEOSA VAR PEENERI	SIT:H	8	a
362	OLIGAWTHA	SUABE	14	a

APPENDIX 2

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
363	OLSENII	MAJ:O	1	s
364	ORARIA	SLUAE	9	g
365	ORBIFOLIA	SIVCCA	12	a
366	OREADES	MAKDA	8	u
367	ORGADOPHILA	SUH:C	25	d
368	OVATA	SPEAB	34	q
369	OVULARIS	SLUAA	1	i
370	OXYMITRA	SIVAC	21	a
371	PACHYCALYX	SIQ:E	4	d
372	PACHYLOMA	MABAA	4	j
373	PACHYPHYLLA	SIVEO	33	a
374	PALIFORMIS	MAKIM	2	s
375	PANDA GREEN LEAF	SUV:N	1	d
376	PANDA SUBSP ILLAQUENS	SUV:EB	5	w
377	PANDA SUBSP PANDA	SUV:G	6	e
378	PANICULATA	SUV:D	14	n
379	PAPUANA	BAA:B	121	a
380	PARRAMATTENSIS	SNECFA	6	w
381	PARRAMATTENSIS NEWCASTLE	SNECFB	2	v
382	PARVIFOLIA	SPIBA	1	s
383	PATELLARIS	SUABC	22	a
384	PATENS	MABBA	7	g
385	PAUCIFLORA ADAMINABY	MAKHAE	1	s
386	PAUCIFLORA SUBSP DEBEUZEVILLEI	MAKHAD	4	t
387	PAUCIFLORA SUBSP NIPHOPHILA	MAKHAC	8	r
388	PAUCIFLORA SUBSP PAUCIFLORA	MAKHAA	34	q
389	PELLITA	SECCA	19	n
390	PELTATA SUBSP LEICHHARDTII	CCA:AB	16	d
391	PELTATA SUBSP PELTATA	CCA:AA	11	d
392	PENDENS	MADAD	3	g
393	PERFOLIATA	CAA:E	13	a
394	PERRINIANA	SPINN	10	t
395	PHAEOTRICHA	MAHEC	25	n
396	PHOENICEA	EFC:B	19	a
397	PILEATA	SLE:GB	14	h
398	PILLIGAEHSIS	SUL:F	14	o
399	PILULARIS	MAIAA	17	n
400	PIMPINIANA	SLOAA	5	a
401	PIPERITA SUBSP PIPERITA	MATHAA	8	w
402	PIPERITA SUBSP URCEOLARIS	MATHAC	3	x
403	PLANCHONIANA	MAIBB	7	l
404	PLATYCORYS	SLI:DB	14	h
405	PLATYPHYLLA VAR PLATYPHYLLA	SNABAC	12	d
406	PLATYPHYLLA VAR TINTINNANS	SNABAD	3	a
407	PLATYPUS VAR HETEROPHYLLA	SIDCBB	6	h
408	PLATYPUS VAR PLATYPUS	SIDCBA	7	j
409	PLENISSIMA	SIT:G	9	g
410	POLYANTHEMOS	SUT:D	24	q
411	POLYBRACTEA	SUNED	5	b
412	POLYCARPA VAR POLYCARPA	CAFIB	111	a
413	POLYCARPA VAR OLIGOCARPA	CAFEGG	28	a
414	POPULNEA	SUDEAA	63	d
415	POROSA	SUNCC	28	b
416	PORRECTA	CAFIF	5	a
417	PREISSIANA	MAA:B	4	j
418	PROMINENS	SII:G	3	a
419	PROPINQUA	SECEA	16	n
420	PRUINOSA	SUP:Y	53	a
421	PRYORIANA	SPIKKI	8	t
422	PTYCHOCARPA	CAB:A	22	a
423	PULCHELLA	MATEG	4	c
424	PULVERULENTA	SPINQ	4	r
425	PUNILA	SNECH	1	v
426	PUNCTATA VAR PUNCTATA	SECEDA	9	w
427	PUNCTATA VAR DIDYMA	SECEDD	9	l
428	PUNCTATA VAR LONGIROSTRATA	SECEDE	14	d
429	PYRIFORMIS	SIVEM	7	g
430	PYROCARPA	MAIAB	5	l
431	QUADRANGULATA	SPIHA	9	u
432	RACEMOSA	MATKE	6	w
433	RADIATA SUBSP RADIATA	MATELA	23	q
434	RADIATA SUBSP ROBERTSONII	MATELC	13	q
435	RAMELIANA	SIVEK	1	a

APPENDIX 2

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
436	RAVERETIANA	SBA:C	8	d
437	REDUNCA	SIGAC	30	h
438	REGNANS	MAKCA	11	c
439	REMOTA	MAKEB	1	b
440	RESINIFERA	SECCC	21	n
441	RHODANTHA	SIVEF	3	g
442	RIGIDULA	SIZ:A	13	h
443	RISDONII	MATEB	1	c
444	ROBUSTA	SECAF	15	n
445	RODWAYI	SPEAH	4	c
446	ROSSII	MATKF	16	q
447	ROYCEI	EAACL	3	a
448	RUBIDA	SPINF	32	q
449	RUDDERI	SUT:A	6	u
450	RUDIS	SNEER	14	g
451	RUGOSA	SLI:A	17	b
452	RUMMERYI	SUAAA	6	l
453	RUPICOLA	MAKIJ	1	x
454	SALIGNA	SECAC	23	n
455	SALMONOPHLOIA	SIU:A	17	h
456	SALUBRIS	SIK:A	21	h
457	SARGENTII	SIDAE	5	h
458	SAXATILIS	SPINJ	2	t
459	SCLEROPHYLLA	MATKB	7	w
460	SCOPARIA	SPECM	2	l
461	SECAE	SECAE	1	d
462	SECEDF	SECEDF	4	d
463	SEEANA	SNECA	9	l
464	SEEANA BLACKDOWN	SNECAC	2	d
465	SEPULCRALIS	MADAC	4	j
466	SESSILIS	SIVES	11	a
467	SETOSA	CAA:A	78	a
468	SHEATHIANA	SLE:C	16	h
469	SHIRLEYI	SUP:W	11	d
470	SIDEROPHLOIA	SUP:I	32	n
471	SIDEROXYLON SUBSP SIDEROXYLON	SUX:IA	29	o
472	SIDEROXYLON SUBSP TRICARPA	SUX:IB	9	r
473	SIEBERI	MAKED	12	r
474	SIGNATA	MATKD	12	l
475	SIMILIS	EFAAA	12	d
476	SIR:AB	SIR:AB	2	g
477	SIVCCC AFF ORBIFOLIA	SIVCCC	1	a
478	SLE:L	SLE:L	3	i
479	SLE:O	SLE:O	1	i
480	SMITHII	SPIKE	9	r
481	SNADB	SNADB	4	a
482	SNECAC	SNECAC	2	l
483	SNECC	SNECC	5	l
484	SOCIALIS	SIT:L	89	a
485	SPARSA	SUNCD	10	a
486	SPATHULATA SUBSP GRANDIFLORA	SIDCDB	6	h
487	SPATHULATA SUBSP SPATHULATA	SIDCDA	10	h
488	SPHAEROCARPA	MAIBA	1	d
489	SPIJAD	SPIJAD	2	c
490	SQUAMOSA	SIQ:A	4	w
491	STAERI	MADCB	4	j
492	STAIGERAMA	SUP:Q	3	d
493	STEEDMANII	SIDCF	1	i
494	STELLULATA	MAKMA	23	q
495	STENOSTOMA	MAKIA	1	s
496	STOATEI	SLOBA	1	j
497	STOWARDII	SIDAG	4	g
498	STRIATICALYX	SLE:F	26	a
499	STRICKLANDII	SIJ:C	5	i
500	STRICTA	MAKIG	6	r
501	STURGISSIANA	SPIAF	2	x
502	SUBCRENULATA	SPIJAB	2	c
503	SUDAE	SUDAE	3	h
504	SUL:BB	SUL:BB	4	d
505	SUL:BC	SUL:BC	7	l
506	SUL:BD	SUL:BD	18	d
507	SUP:N	SUP:N	1	d
508	SUV:F	SUV:F	8	d

APPENDIX 2

Taxon #	*Taxon name*	*Pryor & Johnson code*	*Number of MSD*	*Group code*
509	TALYUBERLUP	SICBI	1	j
510	TECTIFICA	SUADA	29	a
511	TENUIPES	GAA:C	14	d
512	TEKUIRAMIS	MATEC	6	c
513	TERETICORNIS	SNEEB	65	n
514	TERMINALIS	CAFEP	133	a
515	TESSELLARIS	BAA:A	53	d
516	TETRAGONA	EAAAA	13	h
517	TETRAPLEURA	SUV:H	2	l
518	TETRAPTERA	SLOBC	7	h
519	TETRODONTA	EAC:A	51	a
520	THOZETINKA	SUJ:A	29	d
521	TINDALIAE	MAHCI	5	l
522	TODTIANA	MABBB	7	g
523	TORELLIANA	CCB:A	7	d
524	TORQUATA	SLI:M	3	i
525	TRACHYPHLOIA	CAFUJ	38	d
526	TRANSCONTINENTALIS	SIT:K	31	h
527	TRIFLORA	MAKIC	1	x
528	TRIVALVIS	SII:E	20	a
529	UMBRA SUBSP CARNEA	MAG:AB	18	n
530	UMBRA SUBSP UMBRA	MAG:AA	26	n
531	UMBRAWARRENSIS	SNABI	7	a
532	UNCINATA	SIZ:E	10	h
533	URNIGERA	SPINL	3	c
534	VERNICOSA	SPIJAA	4	c
535	VIMINALIS SUBSP VIMINALIS	SPIKKA	47	q
536	VIMINALIS SUBSP CYGNETENSIS	NV	7	b
537	VIRIDIS VAR VIRIDIS	SUNEHA	24	o
538	VIRIDIS VAR LATIUSCULA	SUNEHB	5	o
539	WANDOO	SIGAA	17	h
540	WATSONIANA	CCA:D	9	d
541	WEBSTERANA	SIVCCB	7	i
542	WHITEI	SUP:H	12	d
543	WOODWARDII	SLE:A	2	i
544	XANTHOKEMA	SIGAG	3	j
545	YALATENSIS	SIT:M	10	a
546	YARRAENSIS	SPEAC	3	t
547	YOUMANII	MAHAE	12	l
548	YOUNGIANA	SIVEN	14	a
549	YUMBARRANA SUBSP STRIATA	SIT:DB	1	a
550	YUMBARRANA SUBSP YUMBARRANA	SITOA	7	a
551	ZYGOPHYLLA	CAA:D	15	a

Appendix 3

List of mapsheets in all zones at the 25-group level. The numbers in brackets are the map numbers assigned by us for the analysis (see Appendix 1).

Group A: 80 members

ABMINGA	(1)	CORDILLO	(114)	INNAMINC	(211)	BETOOTA	(46)	BIRDSVIL	(49)	MACHATTI	(259)	McDILLS	(278)	BULIDO	(69)
DURHAM D	(145)	THARGOMI	(438)	TICKALAR	(441)	HOMEBOIN	(204)	BILLA KA	(47)	GASON	(172)	KENNEDY	(226)	PANDIE P	(355)
ROBINSON	(393)	SIMPSON	(410)	COOBER P	(107)	ADAVALE	(3)	ANKETELL	(15)	BOULIA	(58)	WARRINA	(464)	ANDAMOOK	(13)
KOPPERAM	(233)	MILPARIN	(288)	FROME	(168)	CURNAMON	(123)	CANTERBU	(84)	DALHOUSI	(125)	GLENBURG	(178)	SPRINGVA	(416)
WINTON	(485)	CURDIMUR	(122)	MARREE	(274)	OODNADAT	(350)	WINTINNA	(484)	MURLOOCO	(321)	CALLABON	(78)	BYRO	(76)
ANGLEDOO	(14)	MOREE	(295)	BLACKALL	(52)	CUNNAMUL	(121)	TOOMPINE	(443)	YANTABUL	(495)	WHITE CL	(474)	EROMANGA	(155)
EULO	(158)	URISINO	(453)	CHARLEVI	(89)	WYANDRA	(489)	ENNGONIA	(153)	QUILPIE	(383)	IVANHOE	(216)	WALGETT	(456)
ALBERGA	(7)	WOODROFF	(487)	EVERARD	(159)	TALBOT	(426)	ALICE SP	(9)	HENBURY	(195)	HERMANNS	(197)	AYERS RO	(24)
LAKE AMA	(237)	FINKE	(161)	KULGERA	(234)	RAWLINSO	(388)	RODINGA	(396)	BLOODS R	(53)	COOPER	(111)	MANN	(271)
SCOTT	(408)	MOUNT LI	(309)	PETERMAN	(365)	ALCOOTA	(8)	HUCKITTA	(206)	ILLOGWA	(209)	NAPPERBY	(324)	BRUNETTE	(67)

Group B: 81 members

LANDER R	(240)	ELKEDRA	(150)	SANDOVER	(406)	TOBERMOR	(442)	AVON DOW	(23)	THE GRAN	(439)	MOUNT PE	(311)	BARROW C	(35)
BONNEY W	(55)	URANDANG	(451)	HELEN SP	(194)	TENNANT	(437)	CLONCURR	(97)	MOUNT IS	(308)	FREW RIV	(167)	BURKETOW	(71)
DONORS H	(137)	NOONKANB	(338)	PORT HED	(374)	DOBBYN	(135)	MOUNT DR	(304)	SOUTH LA	(413)	DAMPIER	(127)	WINNING	(483)
YANREY	(494)	MOUNT BR	(301)	PYRAMID	(380)	ROY HILL	(401)	ROEBOURN	(397)	MARBLE B	(273)	YARRALOO	(498)	ONSLOW	(349)
ROBERTSO	(392)	BEETALOO	(40)	WAVE HIL	(467)	NEWCASTL	(332)	JULIA CR	(221)	MOUNT RA	(313)	CAMOOWEA	(82)	RUTLAND	(403)
MILLUNGE	(287)	DIXON RA	(134)	GORDON D	(182)	BROWNE	(66)	HALE RIV	(188)	DUCHESS	(142)	MOUNT DO	(303)	RICHMOND	(391)
GALBRAIT	(170)	MOUNT TH	(316)	WINDORAH	(481)	YARRIE	(499)	HERBERT	(196)	WOORAMEL	(488)	MINILYA	(290)	NINGALOO	(335)
MOUNT YO	(318)	EDJUDINA	(148)	NABBERU	(323)	MOUNT PH	(312)	BALFOUR	(27)	HAY RIVE	(193)	NULLAGIN	(342)	COBB	(99)
GUNANYA	(186)	LAKE MAC	(239)	ALROY	(11)	BIRRINDU	(51)	HIGHLAND	(199)	MOUNT SO	(315)	MOUNT RE	(314)	RANKEN	(385)
SAHARA	(404)	BILLILUN	(48)	TANAMI	(431)	GLENORMI	(180)	MOUNT WH	(317)	MACDONAL	(258)	MORRIS	(297)	WEBB	(468)
WINNECKE	(482)														

Group C: 10 members

BRIGHTON	(62)	MCKINLAY	(279)	MUTTABUR	(322)	MACKUNDA	(261)	GILBERTO	(175)	MANEROO	(269)	TANGORIN	(433)	JUNDAH	(222)
MANUKA	(272)	MORNINGT	(296)												

Group D: 68 members

ALLIGATO	(10)	FERGUSSO	(160)	KATHERIN	(224)	PINE CRE	(366)	MOUNT EV	(307)	ARNHEM B	(16)	COBOURG	(101)	MELVILLE	(282)
DARWIN	(128)	DRYSDALE	(139)	PRINCE R	(378)	GOVE	(184)	MILINGIM	(286)	ASHTON	(17)	AUVERGNE	(22)	CAMBRIDG	(80)
DELAMERE	(130)	LISSADEL	(252)	CHARNELY	(90)	MOUNT EL	(306)	LENNARD	(246)	BAUHINIA	(39)	CALVERT	(79)	VICTORIA	(454)
LARRIMAH	(242)	URAPUNGA	(452)	DALY WAT	(126)	LAWN HIL	(245)	WESTMORE	(472)	TANUMBIR	(434)	BROOME	(65)	DERBY	(132)
MOUNT AN	(299)	YAMPI	(493)	LAGRANGE	(236)	CROYDON	(117)	NORMANTO	(340)	GEORGE TO	(173)	RED RIVE	(389)	WALSH	(458)
LANSDOWN	(241)	LIMBUNYA	(249)	WATERLOO	(466)	CAPE SCO	(86)	PORT KEA	(375)	PELLEW	(358)	PORT LAN	(376)	TRUANT I	(447)
MOUNT MA	(310)	BATHURST	(38)	MONTAGUE	(292)	LONDONDE	(253)	CAMDEN S	(81)	FOG BAY	(163)	BLUE MUD	(54)	ROPER RI	(399)
WESSELL	(471)	AURUKUN	(21)	CAPE MEL	(85)	ERAGOOLA	(154)	CAPE WEY	(87)	COEN	(102)	WEIPA	(469)	JARDINE	(218)
ORFORD B	(352)	TORRES S	(445)	HANN RIV	(190)	HERON IS	(198)								

Group E: 48 members

ATHERTON	(18)	EINASLEI	(149)	TOWNSVIL	(446)	CAIRNS	(77)	COOKTOWN	(109)	MOSSMAN	(298)	INGHAM	(210)	INNISFAI	(212)
AYR	(25)	PERCY IS	(362)	PROSERPI	(379)	BOWEN	(60)	BUCHANAN	(68)	JERICHO	(219)	CHARTERS	(91)	CLARKE R	(95)
HUGHENDE	(207)	CLERMONT	(96)	EMERALD	(152)	MACKAY	(260)	ROCKHAMP	(395)	ST LAWRE	(419)	MOUNT CO	(302)	GALILEE	(171)
LONGREAC	(254)	BARALABA	(31)	SPRINGSU	(415)	MUNDUBBE	(319)	DUARINGA	(140)	MONTO	(293)	BRISBANE	(63)	IPSWICH	(214)
GYMPIE	(187)	BUNDABER	(70)	MARYBORO	(275)	CHINCHIL	(93)	DALBY	(124)	TAROOM	(436)	GOONDIWI	(181)	EDDYSTON	(146)
PORT CLI	(372)	DIRRANBA	(133)	ROMA	(398)	ST GEORG	(418)	MITCHELL	(291)	TAMBO	(429)	SURAT	(422)	AUGATHEL	(19)

Group F: 5 members

HODGSON (202)	WALLHALL (457)	LUCAS (257)	ROBINSON (394)	TANAMI E (432)			

Group G: 9 members

CROSSLAN (116)	MANDORA (268)	HOLROYD (203)	PENDER (360)	TABLETOP (425)	NEWMAN (334)	RUDALL (402)	PEAK HIL (357)
STANLEY (420)							

Group H: 15 members

BELELE (42)	COLLIER (106)	KINGSTON (231)	GLENGARR (179)	WILUNA (480)	LEONORA (248)	SIR SAMU (412)	SANDSTON (407)
YOUANMI (500)	WANNA (460)	YOWALGA (501)	WYLOO (490)	DUKETON (143)	LENNIS (247)	MASON (276)	

Group I: 2 members

BENTLEY (45)	WILSON (479)						

Group J: 75 members

ADELAIDE (4)	BARKER (32)	KINGSCOT (230)	NARACOOR (325)	PINNAROO (368)	RENMARK (390)	BURRA (74)	KIMBA (227)
LINCOLN (250)	MAITLAND (264)	WHYALLA (475)	PORT AUG (371)	YARDEA (496)	ANA BRAN (12)	BALRANAL (30)	MILDURA (285)
OUYEN (354)	SWAN HIL (423)	CHOWILLA (94)	POONCARI (370)	MENINDEE (283)	COPLEY (113)	OLARY (348)	ORROROO (353)
PARACHIL (356)	BURNABBI (72)	COOMPANA (110)	MADURA (263)	ELLISTON (151)	FOWLER (166)	STREAKY (421)	NULLARBO (343)
CULVER (119)	EUCLA (157)	BARMATO (34)	BOURKE (59)	LOUTH (256)	WILCANNI (478)	COBAR (98)	NYMAGEE (345)
NYNGAN (346)	BROKEN H (64)	BOOLIGAL (56)	COBHAM L (100)	MANARA (267)	HAY (192)	CARGELLI (88)	NARRANDE (328)
FORBES (164)	NARROMIN (329)	COOTAMUN (112)	DENILIQU (131)	JERILDER (220)	BARTON (36)	OOLDEA (351)	MAURICE (277)
WYOLA (491)	GILES (176)	TARCOOLA (435)	WELLS (470)	TALLARIN (428)	BIRKSGAT (50)	LINDSAY (251)	NOORINA (339)
COOK (108)	KINGOONY (229)	GAIRDNER (169)	TORRENS (444)	FORREST (165)	NOONAERA (337)	NUYTS (344)	NEALE (330)
PLUMRIDG (369)	RASON (386)	THROSSEL (440)					

Group K: 1 member

NARETHA (326)							

Group L: 33 members

AJANA (5)	DONGARA (136)	GERALDTO (174)	BENCUBBI (43)	KELLERBE (225)	SOUTHERN (414)	MOORA (294)	PERENJOR (363)
JACKSON (217)	YALGOO (492)	BARLEE (33)	NINGHAN (336)	BALLADON (28)	NORSEMAN (341)	BOORABBI (57)	KALGOORL (223)
KURNALPI (235)	WIDGIEMO (477)	LAKE JOH (238)	CUNDEELE (120)	ZANTHUS (502)	BREMER B (61)	MOUNT BA (300)	ESPERANC (156)
NEWDEGAT (333)	RAVENSTH (387)	MALCOLM (265)	CORRIGIN (115)	DUMBLEYU (144)	HYDEN (208)	LAVERTON (244)	MENZIES (284)
MINIGWAL (289)							

Group M: 8 members

ALBANY (6)	PEMBERTO (359)	AUGUSTA (20)	BUSSELTO (75)	COLLIE (105)	PINJARRA (367)	PERTH (364)	HILL RIV (200)

Group N: 4 members

CUE (118)	KIRKALOC (232)	MOUNT ED (305)	MURGOO (320)				

Group O: 1 member

CHILDARA (92)							

Group P: 31 members

BAIRNSDA (26)
BATHURST (37)
ULLADULL (450)
TWEED HE (449)
WARBURTO (461)
DUBBO (141)
GILGANDR (177)
DORRIGO (138)
MALLACOO (266)
SINGLETO (411)
NARRABRI (327)
HASTINGS (191)
MELBOURN (281)
BEGA (41)
INVERELL (213)
GRAFTON (185)
WARRAGUL (462)
CANBERRA (83)
MANILLA (270)
WARWICK (465)
TALLANGA (427)
GOULBURN (183)
TAMWORTH (430)
NEWCASTL (331)
WANGARAT (459)
SYDNEY (424)
COFFS HA (103)
WIDE BAY (476)
WAGGA WA (455)
WOLLONGO (486)
MACLEAN (262)

Group Q: 18 members

BALLARAT (29)
PORTLAND (377)
FLINDERS (162)
BENDIGO (44)
BURNIE (73)
KING ISL (228)
ST ARNAU (417)
HOBART (201)
HORSHAM (205)
OATLANDS (347)
COLAC (104)
QUEENSTO (382)
QUEENSCL (381)
LAUNCEST (243)
HAMILTON (189)
PORT DAV (373)
PENOLA (361)
DEAL ISL (129)

Group R: 1 member

SALE (405)

Group S: 5 members

ABROLHOS (2)
QUOBBA (384)
SHARK BA (409)
EDEL (147)
YARINGA (497)

Group T: 1 member

ROTTNEST (400)

Group U: 1 member

TUREE CR (448)

Group V: 1 member

MEDUSA B (280)

Group W: 1 member

WESTWOOD (473)

Group X: 1 member

LOONGANA (255)

Group Y: 1 member

IRWIN IN (215)

Appendix 4

List of taxa in all taxon groups at the 25-group level. The numbers in brackets are the taxon numbers assigned by us for the analysis (see Appendix 2).

Group a: 101 members

ABBREVIA (1)
FERRUGIN (186)
HERBERTI (234)
KOOLPINE (255)
COLLINA (111)
ARGILLAC (34)
PAPUANA (379)
GAMOPHYL (202)
OXYMITRA (370)
PROMINEN (418)
YUMBARRA (549)
GONGYLOC (217)
ORBIFOLI (365)
BRACHYAN (64)
PHOENICE (396)
CYANOCLA (133)
PORRECTA (416)
MOOREANA (329)
PRUINOSA (420)
SETOSA (467)
POLYCARP (413)
SPARSA (485)
ROYCEI (447)
YALATENS (545)
KINGSMIL (250)
CAMALDUL (87)
APODOPHY (29)
GRANDIFO (222)
PATELLAR (383)
DISTANS (156)
CONFLUEN (116)
ASPERA (38)
MICROTHE (325)
ODONTOCA (355)
SIVCCC A (477)
OCHROPHL (354)
CYANOPHY (134)
YOUNGIAN (548)
INTERTEX (241)
UMBRAWAR (531)
TECTIFIC (510)
AFFTECTI (10)
BREVIFOL (69)
LIRATA (278)
LEUCOPHL (271)
TERMINAL (514)
PACHYPHY (373)
MANNENSI (305)
RAMELIAN (435)
LANSDOWN (262)
EREMICOL (171)
MORRISII (333)
BIGALERI (56)
BLEESERI (60)
KOMBOLGI (253)
CLIFTONI (107)
SNADB (481)
CONFERTI (115)
NORMANTO (345)
BAA:J (40)
TRIVALVI (528)
CALCAREA (81)
FLINDERS (191)
STRIATIC (498)
LARGIFLO (264)
FOELSCHE (194)
LATIFOLI (265)
PLATYPHY (406)
ZYGOPHYL (551)
FITZGERA (190)
MINIATA (326)
BRASSIAN (68)
GILLENII (206)
ARGILLAC (35)
OLEOSA V (361)
GILLII (207)
OLEOSA V (359)
PTYCHOCA (422)
OLIGANTH (362)
NABARLEK (337)
HOUSEANA (235)
ALBA (13)
TETRODON (519)
NESOPHIL (339)
LUCENS (284)
CUPULARI (131)
PIMPINIA (400)
SOCIALIS (484)
CONCINNA (113)
JENSENII (244)
CLAVIGER (105)
JACOBSIA (243)
PERFOLIA (393)
POLYCARP (412)
DICHROMO (152)
AFF TERM (8)
SESSILIS (466)
FRUTICOS (201)
YUMBARRA (550)
CARNEI (95)
LUCASII (283)

Group b: 22 members

ALPINA (16)
DIVERSIF (158)
COSMOPHY (126)
FROGGATT (200)
CLADOCAL (104)
LEUCOXYL (273)
POLYBRAC (411)
ODORATA (357)
REMOTA (439)
BEHRIANA (52)
ODORATA (356)
FASCICUL (184)
LEUCOXYL (272)
POROSA (415)
VIMINALI (536)
LEUCOXYL (275)
LEUCOXYL (274)
RUGOSA (451)
DUMOSA (164)
CNEORIFO (109)
BRACHYCA (65)
LANSDOWN (261)

Group c: 20 members

AMYGDALI (18)
JOHNSTON (246)
ARCHERI (33)
COCCIFER (110)
MORRISBY (332)
GLOBULUS (213)
VERNICOS (534)
URNIGERA (533)
REGNANS (438)
CORDATA (122)
SPIJAD (489)
NITIDA (344)
PULCHELL (423)
SUBCRENU (502)
GUNNII (229)
BARBERI (48)
TENUIRAM (512)
RISDONII (443)
RODWAYI (445)
BROOKERA (73)

Group d: 54 members

ABERGIAN (2)
WHITEI (542)
RAVERETI (436)
ERYTHROP (176)
MELANOPH (316)
SUV:F (508)
PANDA GR (375)
PACHYCAL (371)
PELTATA (391)
SUP:N (507)
PELTATA (390)
TRACHYPH (525)
MAJOR (302)
HALLII (232)
TORELLIA (523)
SHIRLEYI (469)
AFF PELT (7)
CLOEZIAN (108)
BAKERI (44)
PUNCTATA (428)
SECAE (461)
HOWITTIA (236)
CULLENII (130)
BLOXSOME (61)
MAG:AC (294)
POPULNEA (414)
SUL:BD (506)
MAGIF (295)
SUL:BB (504)
LEPTOPHL (268)
TENUIPES (511)
DREPANOP (162)
CURTISII (132)
AFF. LAE (9)
MAHECB (296)
STAIGERA (492)
GILBERTE (205)
CAMBAGEA (88)
EXSERTA (182)
DECORTIC (145)
SECEDF (462)
SPHAEROC (488)
BROWNII (74)
MICRONEU (324)
THOZETIA (520)
TESSELLA (515)
WATSONIA (540)
CAFIE (80)
SIMILIS (475)
PLATYPHY (405)
CITRIODO (103)
ORGADOPH (367)
MELANOLE (315)
SEEANA B (464)

Group e: 2 members

ARGOPHLO (36)
PANDA SU (377)

Group f: 1 member

CONGLOME (118)

Appendix 4

Group g: 37 members

ACCEDENS	(4)	TODTIANA	(522)	DRUMMOND	(163)	MACROCAR	(289)	LANEPOOL	(260)	PENDENS	(392)	RHODANTH	(441)	ERYTHRON	(175)
KOCHII	(252)	PYRIFORM	(429)	STOWARDI	(497)	EBBANOEN	(168)	OLDFIELD	(358)	PLENISSI	(409)	EWARTIAN	(179)	BEARDIAN	(51)
SIR:AB	(476)	DONGARRA	(160)	EUDESMIO	(177)	ORARIA	(364)	JUCUNDA	(247)	ERYTHROC	(173)	GITTINSI	(208)	JOHNSONI	(245)
BREVISTY	(70)	DIVERSIC	(157)	FICIFOLI	(189)	GUILFOYL	(227)	MEGACARP	(313)	PATENS	(384)	CALOPHYL	(85)	MARGINAT	(311)
RUDIS	(450)	EXILIS	(180)	GOMPHOCE	(216)	LAELIAE	(258)	HAEMATOX	(231)						

Group h: 61 members

ALBIDA	(15)	KONDININ	(254)	LOXOPHLE	(281)	MYRIADEN	(336)	SPATHULA	(487)	ASTRINGE	(39)	FALCATA	(183)	WANDOO	(539)
DECIPIEN	(144)	TETRAGON	(516)	GARDNERI	(203)	OCCIDENT	(353)	ANNULATA	(26)	UNCINATA	(532)	PLATYPUS	(407)	TETRAPTE	(518)
GONIANTH	(218)	SPATHULA	(486)	CYLINDRI	(135)	LEPTOCAL	(267)	DIPTERA	(154)	MERRICKI	(319)	DEFLEXA	(147)	DIELSII	(153)
GROSSA	(226)	FORRESTI	(196)	FRASERI	(198)	BRACHYCO	(66)	BURRACOP	(78)	ERYTHRON	(174)	SARGENTI	(457)	CAESIA	(79)
CLELANDI	(106)	LEPTOPOD	(269)	SALUBRIS	(456)	SHEATHIA	(468)	CYLINDRO	(136)	PLATYCOR	(404)	MELANOXY	(317)	CELASTRO	(96)
LONGICOR	(279)	TRANSCON	(526)	EREMOPHI	(172)	SALMONOP	(455)	FLOCKTON	(192)	PILEATA	(397)	LOXOPHLE	(282)	REDUNCA	(437)
RIGIDULA	(442)	CORRUGAT	(125)	SUDAE	(503)	CRUCIS	(129)	ANCEPS	(19)	ANGULOSA	(23)	CONGLOBA	(117)	COOPERAN	(121)
CALYCOGO	(86)	INCRASSA	(238)	FOECUNDA	(193)	OLEOSA V	(360)	GRACILIS	(221)						

Group i: 24 members

ANGULOSA	(24)	JUTSONII	(248)	FORMANII	(195)	BALLADON	(45)	WOODWARD	(543)	STEEDMAN	(493)	CERASIFO	(98)	GEORGEI	(204)
BRACHYPH	(67)	DUNDASII	(165)	KRUSEANA	(256)	CAMPASPE	(91)	STRICKLA	(499)	TORQUATA	(524)	GRIFFITH	(225)	WEBSTERA	(541)
SLE:L	(478)	COMITAEV	(112)	LESOUEFI	(270)	MABIR	(286)	BROCKWAY	(72)	OVULARIS	(369)	SLE:O	(479)	EFFUSA	(169)

Group j: 33 members

ACIES	(5)	NEWBEYI	(340)	CALCICOL	(82)	BUPRESTI	(75)	TALYUBER	(509)	JACKSONI	(242)	MACROCER	(290)	STAERI	(491)
ANGUSTIS	(25)	SEPULCRA	(465)	MICRANTH	(321)	BURDETTI	(76)	MACRANDR	(288)	CORONATA	(124)	XANTHONE	(544)	NUTANS	(349)
PREISSIA	(417)	CORNUTA	(123)	DECURVA	(146)	DORATOXY	(161)	LEHMANNI	(266)	PLATYPUS	(408)	CONFERRU	(114)	LIGULATA	(276)
PACHYLOM	(372)	AQUILINA	(32)	GONIANTH	(219)	INSULARI	(239)	BENNETTI	(53)	DESMONDE	(151)	MEGACORN	(314)	STOATEI	(496)
FORRESTI	(197)														

Group k: 1 member

DISCRETA	(155)

Group l: 33 members

ACACIIFO	(3)	PYROCARP	(430)	MAHEM	(300)	TETRAPLE	(517)	ANDREWSI	(21)	PUNCTATA	(427)	APPROXIM	(30)	TINDALIA	(521)
APPROXIM	(31)	CAMERONI	(89)	RUMMERYI	(452)	BANKSII	(47)	DUNNII	(166)	HENRYI	(233)	SEEANA	(463)	NIGRA	(342)
PLANCHON	(403)	SIGNATA	(474)	SCOPARIA	(460)	SNECAC	(482)	ANDREWSI	(20)	BANCROFT	(46)	SUL:BC	(505)	CALEYI	(83)
LAEVOPIN	(259)	DALRYMPL	(139)	MOLUCCAN	(328)	YOUMANII	(547)	CALIGINO	(84)	NICHOLII	(341)	MANNIFER	(306)	NOVAANGL	(348)
SNECC	(483)														

Group m: 8 members

ACMENOID	(6)	UMBRA SU	(530)	INTERMED	(240)	PHAEOTRI	(395)	BAILEYAN	(43)	GRANDIS	(223)	CREBRA	(127)	TERETICO	(513)

Group n: 14 members

EUGENIOI	(178)	FIBROSA	(187)	SIDEROPH	(470)	MACULATA	(293)	SALIGNA	(454)	MICROCOR	(323)	PROPINQU	(419)	UMBRA SU	(529)
GUMMIFER	(228)	ROBUSTA	(444)	RESINIFE	(440)	PANICULA	(378)	PILULARI	(399)	PELLITA	(389)				

Group o: 10 members

CONICA	(119)
VIRIDIS	(537)
DEALBATA	(141)
MICROCAR	(322)
SIDEROXY	(471)
DEALBATA	(142)
PILLIGAE	(398)
FIBROSA	(188)
VIRIDIS	(538)
DWYERI	(167)

Group p: 2 members

MALACOXY	(304)
McKIEANA	(312)

Group q: 31 members

AGGLOMER	(11)
RADIATA	(433)
RADIATA	(434)
GONIOCAL	(220)
FASTIGAT	(185)
GLOBOIDE	(211)
NITENS	(343)
MACRORHY	(292)
OBLONGA	(351)
CAMPHORA	(92)
ALBENS	(14)
NORTONII	(346)
CINEREA	(100)
GLOBULUS	(212)
BLAKELYI	(57)
OBLIQUA	(350)
BAUERANA	(49)
POLYANTH	(410)
MELLIODO	(318)
VIMINALI	(535)
BRIDGESI	(71)
DIVES	(159)
ROSSII	(446)
PAUCIFLO	(388)
STELLULA	(494)
MANNIFER	(308)
AROMAPHL	(37)
RUBIDA	(448)
CYPELLOC	(137)
MANNIFER	(309)
OVATA	(368)

Group r: 25 members

AGGREGAT	(12)
HAEMASTO	(230)
ANGOPHOR	(22)
MAHEG	(297)
PULVERUL	(424)
BOSISTOA	(62)
MUELLERA	(334)
BAEUERLE	(42)
BOTRYOID	(63)
SMITHII	(480)
MOOREI V	(331)
CONSIDEN	(120)
PAUCIFLO	(387)
DENDROMO	(150)
SIEBERI	(473)
SIDEROXY	(472)
GREGSONI	(224)
ELATA	(170)
DALRYMPL	(138)
MANNIFER	(307)
LONGIFOL	(280)
FRAXINOI	(199)
STRICTA	(500)
MOOREI	(330)
GLOBULUS	(214)

Group s: 7 members

BADJENSI	(41)
OLSENII	(363)
PARVIFOL	(382)
STENOSTO	(495)
KARTZOFF	(249)
PAUCIFLO	(385)
PALIFORM	(374)

Group t: 20 members

BAXTERI	(50)
SAXATILI	(458)
PERRINIA	(394)
CEPHALOC	(97)
CINEREA	(101)
BLAKELYI	(58)
PRYORIAN	(421)
CINEREA	(102)
PAUCIFLO	(386)
KITSONIA	(251)
GLOBULUS	(215)
MITCHELL	(327)
CRENULAT	(128)
IMLAYENS	(237)
YARRAENS	(546)
GLAUCESC	(209)
CHAPMANI	(99)
KYBEANEN	(257)
NEGLECTA	(338)
DELEGATE	(149)

Group u: 8 members

AMPLIFOL	(17)
QUADRANG	(431)
NOTABILI	(347)
BENTHAMI	(54)
DEANEI	(143)
OREADES	(366)
MICHAELI	(320)
RUDDERI	(449)

Group v: 5 members

CANALICU	(93)
PARRAMAT	(381)
PUMILA	(425)
GLAUCINA	(210)
LARGEANA	(263)

Group w: 20 members

APICULAT	(27)
MULTICAU	(335)
PANDA SU	(376)
EXIMIA	(181)
PIPERITA	(401)
APICULAT	(28)
OBTUSIFL	(352)
BEYERI	(55)
MAHEK	(299)
CAPITELL	(94)
MAHEO	(301)
PUNCTATA	(426)
RACEMOSA	(432)
DAWSONII	(140)
SQUAMOSA	(490)
MACRORHY	(291)
BLAXLAND	(59)
MANNIFER	(310)
SCLEROPH	(459)
PARRAMAT	(380)

Group x: 11 members

BURGESSI	(77)
STURGISS	(501)
RUPICOLA	(453)
PIPERITA	(402)
CAMFIELD	(90)
TRIFLORA	(527)
DEFORMIS	(148)
MACARTHU	(287)
LUEHMANN	(285)
LIGUSTRI	(277)
MAKDE	(303)

Group y: 1 member

MAHEI	(298)

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